Honourable Union Agriculture Minister Sh. Radha Mohan Singh releasing NDRI Technologies on Feb 9, 2016 at ICAR-NDRI, Karnal

Transfer of technology of ‘Strip Based Test for Detection of Maltodextrin in Milk’ to DELMOS Research Private Ltd. Gurgaon on February 13, 2017.
TECHNOLOGIES AVAILABLE AT NDRI FOR COMMERCIALIZATION
Published by
Dr. R.R.B. Singh
Director
ICAR-NDRI,
Karnal - 132 001, Haryana

Editing and Compilation
Dr. Rajan Sharma
Dr. A.K. Singh

Contact Persons

Chairman, Consultancy
Dr. A.K. Singh, Consultancy Processing Cell
Dairy Technology Division, ICAR-NDRI, Karnal
Ph: 0184-2259291; Fax: 0184-2250042
E-mail: aksndri@gmail.com

For Dairy Cultures
Dr. Sunita Grover, Head
Dairy Microbiology Division
Phone: 0184-2259168
E-mail: sungro@gmail.com

National Collection of Dairy Cultures (NCDC)
Dr. S. K. Tomar, Incharge
Nation Collection of Dairy Cultures (NCDC)
Phone: +91-184-2259196
E-mail: sudhirndri@gmail.com

For Milk Adulteration Detection Kit
Dr. Raman Seth, Principal Scientist
Dairy Chemistry Division, ICAR-NDRI, Karnal
Phone: 0184-2259147
E-mail: ramanseth123@yahoo.co.in

Entrepreneurship Development Programme at NDRI
Dr. A.K. Singh, Incharge
Business Planning and Development (BPD) Unit
ICAR-NDRI, Karnal
Phone: 0184-2259329, 2259304
E-mail: bpdndri@gmail.com
Web: www.ndritbi.com
Institute Technology Management Committee (ITMC)

1. Dr. R.R.B. Singh, Director
   Chairman

2. Dr. Bimlesh Mann, Joint Director (Research) & I/C PME
   Member

3. Joint Director (Academics)
   Member

4. Dr. A.K. Singh, PS, DT Division
   Member

5. Dr. P.K. Singh, Nodal Officer (IPR), NBAGR, Karnal
   Member

6. Dr. Naresh Kumar, PS, DM Division
   Member

7. Dr. Sumit Arora, PS, DC Division
   Member

8. Dr. Rajan Sharma, PS, DC Division
   Member Secretary

For further information, please contact:

Institute Technology Management Committee
ICAR-NATIONAL DAIRY RESEARCH INSTITUTE
Indian Council of Agricultural Research
Karnal-132001, Haryana, India
Email: itmundri@gmail.com
Web: www.ndri.res.in
Phone: 0184-2259532, 9416120181
PREFACE

ICAR- National Dairy Research Institute (NDRI) is committed to develop technologies for enhancing milk production, manufacture of high value and healthy milk products and ensuring quality and safety of milk & products. These technologies are developed by the scientists at the Institute using innovative approaches and state of art facilities and released to the stakeholders only after proper validation. Over the years many such technologies have been transferred to the farmers, cooperative institutions, dairy and food industries and other such stakeholders. Cost effective tests including strips for detection of adulterants, antibiotics residues, pesticides residues and tests for differentiating milk of different species and A1/A2 milk etc are some of the technologies which have found great favours with the industries in recent years. Technologies for the manufacture of several types of fermented dairy products, ready to reconstitute dairy products and functional dairy foods have also been transferred to the industries. Besides, native strains of probiotic dairy cultures that have been characterized and validated are finding potential application for making probiotic dairy foods. Innovative dairy equipments viz. butter melting system, conical press vat (CPV), surface heat exchanger and cooling system for viscous dairy products are also available for transfer to the prospective clients. The institute has also made concerted efforts to protect its Intellectual Property with very impressive record of patent filing and grant of patents over the last few years.

Institute Technology Management Unit (ITMU) at ICAR-NDRI has compiled the technologies developed at NDRI in the form of a publication titled “Technologies Available at NDRI for Commercialization”. I appreciate the efforts of the scientists and their team in bringing out this publication. The document provides salient features of each of the technologies, its sale price and terms & conditions of transfer for commercialization. Entrepreneurs and industrial houses can make use of the available information and commercialize these technologies for providing nutritious, safe and healthy dairy products to the consumers.

I am sure that this publication will help establish an interface between the innovators and the industry and bridge the gap in generation of knowledge and its dissemination so as to usher a new era of co-operation between the institute and the stakeholders in the dairy and food sector.

(R.R.B. Singh)
Director
1. NUTRIMIX  
Ashish Kumar Singh, P.N. Raju, Amol Sahare, R.R.B. Singh and Sumit Arora

2. BLUEBERRY FORTIFIED PROBIOTIC DAHI FOR HEALTH PROMOTION  
Chand Ram and Neha Tanwar

3. TECHNOLOGY OF BHAPA DAHI  
Kaushik Khamrui

4. TECHNOLOGY FOR PREPARATION OF CHOCOLATE BHAPA DOI  
Kaushik Khamrui, Naveen Yadav and Writdhama Prasad

5. TECHNOLOGY FOR PREPARATION OF CURCUMIN ENRICHED GHEE  
Kaushik Khamrui, Jui Lodh and Writdhama Prasad

6. TECHNOLOGY FOR THE PREPARATION OF HIGH ANTIOXIDANT ACTIVITY BUFFALO CASEIN HYDROLYSATES  
Rajesh Kumar, Rajeev Kapila, Nischal Mayur Ashok Rao, Somya, Gulshan Dass, Harisha Bodemala, Bimlesh Mann and Suman Kapila

7. TECHNOLOGY OF REDUCED CALORIE PEDA  
Gunvantsinh Rathod and Kaushik Khamrui

8. WHEY JALJEERA DRINK  
Ashish Kumar Singh, Sudhir Singh, G.R. Patil and R.R.B. Singh

9. WHEY TAMARIND DRINK  
Ashish Kumar Singh, Sanket Borad and R.R.B. Singh

10. WHEY MANGO DRINK  
Ashish Kumar Singh, Sudhir Singh, G.R. Patil and R.R.B. Singh

11. BAJRA LASSI  
Ashish Kumar Singh, Sudhir Tomar, S. K. Kanawjia and Yogesh Khetra

12. MILK PROTEIN-ENRICHED BAJRA SNACKS  
Ashish Kumar Singh, P.N. Raju, Sanket Borad and R.R.B. Singh

13. WHEY-SKIM MILK-MILLET BASED COMPLEMENTARY FOOD  
Ramesh Moda, Ashish Kumar Singh, P.N. Raju and R.R.B. Singh

14. MILK PROTEIN-ENRICHED IRON FORTIFIED BAJRA BISCUIT  
Latha Sabikhi, Ashish Kumar Singh, Devang Jani, Gayatri and Sumit Arora
15. TECHNOLOGY FOR PREPARATION OF SHELF STABLE, NUTRITIONALLY RICH SMOOTHIES USING DAIRY AND NON-DAIRY INGREDIENTS  
Sathish Kumar, M.H, Latha Sabikhi, Thompkinson, Devarja, H.C. and Sumit Arora

16. LOW-CALORIE AND FIBER FORTIFIED MISTI DAHI  
P. Narender Raju and Dharam Pal

17. A PROCESS FOR IRON FORTIFICATION OF PANEER USING EDIBLE COATING  
P. Narender Raju, Parameshwar S. Jotarkar, Ashish Kumar Singh and Sumit Arora

18. TECHNOLOGY FOR THE MANUFACTURE OF ALOE VERA SUPPLEMENTED PROBIOTIC LASSI  
Shaik Abdul Hussain, G.R. Patil and R.R.B. Singh

19. READY-TO-RECONSTITUTE KHEER MIX  

20. READY-TO-RECONSTITUTE RASMALAI MIX  

21. READY-TO-RECONSTITUTE BASUNDI MIX  
Prateek Sharma, R.R.B. Singh, G.R. Patil and A.A. Patel

22. LONG-LIFE MILK-CAKE  
Anil Kumar, G.R. Patil, R.R.B. Singh and A.A. Patel

23. EXTENDED SHELF LIFE FUNCTIONAL PANEER  
S.N. Rajkumar, R.R.B. Singh, G.R. Patil and A.A. Patel

24. LOW FAT OVEN BAKED GULABJAMUN  

25. ARJUNA HERBAL GHEE  
Rajani Kant, G.R. Patil, R.R.B. Singh and A.A. Patel

26. FUNCTIONAL QUARG CHEESE  
S.K. Kanawjia, Yogesh Khetra and Kunal Kadiya

27. TECHNOLOGY FOR MANUFACTURE OF FETA CHEESE FROM COW/ BUFFALO MILK  
S.K. Kanawjia, Sanjeev Kumar and Yogesh Khetra

28. TECHNOLOGY OF A FUNCTIONAL MILK DRINK  
Kaushik Khamrui and Nripendra Kumar Maurya

29. TECHNOLOGY OF REDUCED FAT CHANNA BASED DAIRY SPREAD  
Kaushik Khamrui and Kumar Amit Raj

30. TECHNOLOGY OF LOW SODIUM PROCESSED MOZZARELLA CHEESE  
Yogesh Khetra, S.K. Kanawjia and G.S. Meena
31. A PROCESS FOR THE PREPARATION OF LOW CHOLESTEROL GHEE
   Darshan Lal, Vivek Sharma, Raman Seth, Manoj Kumar and Amit Kumar

32. ENZYME MODIFIED CHEESE TECHNOLOGY
   Bikash C. Ghosh and S. Jaydip Narotambhai

33. TECHNOLOGY OF PREPARATION OF A REDUCED CALORIE NATURALLY CARBONATED SWEETENED FERMENTED DAIRY BEVERAGE
   Sudhir Kumar Tomar, Falguni Patra and A.K. Singh

34. STRAWBERRY WHEY DRINK
   Shilpa Vij and Samlesh

35. HEALTH PROMOTING SOY YOGHURT
   Shilpa Vij and Deepika Yadav

36. LACTOSE FREE SOY DAHI
   Shilpa Vij and Subrota Hati

37. PROBIOTIC WHEY DRINK WITH ANTIDIARREAL ACTIVITY
   Shilpa Vij and Vandana

38. CURCUMIN SOY WHEY DRINK
   Shilpa Vij and Deepender

39. BIOFUNCTIONAL FRUIT YOGHURT
   Shilpa Vij and Jagrani Minj

---

Theme: Technologies for ensuring Quality and Safety of Dairy Products

40. A NEW RAPID TEST FOR DETECTION OF DETERGENT IN MILK
   Rajan Sharma, Y.S. Rajput and Amit Kumar Barui

41. A NEW STRIP BASED TEST FOR DETECTION OF NEUTRALIZERS IN MILK
   Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput and Bimlesh Mann

42. A NEW STRIP BASED TEST FOR DETECTION OF UREA IN MILK
   Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput and Bimlesh Mann

43. STRIP BASED TEST FOR DETECTION OF GLUCOSE IN MILK
   Rajan Sharma, Y.S. Rajput, Bimlesh Mann and Panchal Bhaveshkumar R

44. STRIP BASED TEST FOR DETECTION OF HYDROGEN PEROXIDE IN MILK
   Rajan Sharma, Y.S. Rajput, Bimlesh Mann and Panchal Bhaveshkumar R
45. STRIP BASED TEST FOR DETECTION OF MALTODEXTRIN IN MILK
   Rajan Sharma, Y.S. Rajput, Bimlesh Mann and Panchal Bhaveshkumar R

46. A STRIP BASED TEST FOR DETECTION OF SUCROSE IN MILK
   Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput and Bimlesh Mann

47. PAPER STRIP ASSAY FOR RAPID DETECTION OF PESTICIDE RESIDUES
   Naresh Kumar, N. Tehri, R. Gopaul, P. K. Sharma, Morab S. and Raghu H. V.

48. PAPER STRIP BASED ASSAY FOR DETECTION OF ANTIBIOTIC RESIDUES IN MILK
   Kumar N, Anand, S. P., Shukla R., Suman, Sharma, P. K. and Raghu H.V.

49. TECHNOLOGY TO PREPARE A KIT FOR THE DETECTION OF VEGETABLE OIL/ FAT IN GHEE
   Vivek Sharma, Anupama Rani and Sumit Arora

50. DETECTION OF BUFFALO MILK IN COW MILK USING HANSA TEST SERUM
   Archana Verma

51. METHODOLOGY TO CONFIRM THE PRESENCE OF LARD IN GHEE
   Vivek Sharma, Tanmay Hazara, Sumit Arora, Rekha Sharma and Sachinandan De

52. TWO STAGE ENZYME BASED ASSAY FOR DETECTION OF L. MONOCYTOGENES IN MILK
   Naresh Kumar, M. Balhara, G. Thakur, Raghu H. V., V. K. Singh and Kouser, S.

53. TWO STAGE ENZYME ASSAY FOR DETECTION OF ENTEROCOCCI IN MILK AND MILK PRODUCTS
   Naresh Kumar, G. Kaur, G. Thakur, Raghu H. V., N. A. Singh, N. Raghav and V. K. Singh

54. SPORE BASED KIT FOR DETECTION OF ANTIBIOTIC RESIDUES IN MILK AT DAIRY FARM
   Naresh Kumar, A Khan, S Arora, Raghu H V, M Balhara, P K Sharma and S Shaikh

55. RAPID TEST FOR DETECTION OF E. COLI IN MILK
   Naresh Kumar, Ramakant L, Avinash, Bhawna A, Raghu H.V., M. Balhara, S Kadyan and V. Kumar

56. RAPID TEST FOR DETECTION OF COLIFORMS IN MILK
   Naresh Kumar, Ramakant L, Avinash, Bhawna A, Raghu H.V., M. Balhara, S Kadyan and V. Kumar

57. DNA BASED METHOD FOR DIFFERENTIATION OF COW, BUFFALO, SHEEP, GOAT AND CAMEL MILK
   Sachinandan De, Sushil Kumar and Devika Goutam
58. DNA BASED METHOD FOR DIFFERENTIATION OF COW, BUFFALO, SHEEP, GOAT AND PIG MEAT
   Sachinandan De, Sushil Kumar and Devika Goutam

59. APTAMER FOR AFLATOXIN M1
   Y.S. Rajput, Shilpi Malhotra and Rajan Sharma

60. APTAMER FOR BETACASOMORPHIN-7
   Y.S. Rajput, Abhishek and Rajan Sharma

Theme: Innovative Dairy Equipments

61. COOLING SYSTEM FOR VISCOUS DAIRY PRODUCTS
   I.K. Sawhney, P.S. Minz, Anshuman Raj Gurjar and Avijit Shaw

62. PILOT PLANT IN-LINE SYSTEM FOR MANUFACTURE OF TRADITIONAL INDIAN DAIRY PRODUCTS
   P.S. Minz, I.K. Sawhney, Birkram Kumar and S.P. Agarwal

63. PROTOTYPE OF IMPROVED BUTTER MELTING SYSTEM
   I.K. Sawhney, Aswin Warrier and P.S. Minz

64. CONICAL PROCESS VAT (CPV)
   S.P. Agarwal, I.K. Sawhney, Birkram Kumar and P.S. Minz

Theme: Innovative Dairy Culture

66. PROBIOTIC BACTERIAL CULTURE FOR PREPARATION OF FERMENTED MILK PRODUCTS WITH IMMUNO MODULATORY ATTRIBUTES
   Rajeev Kapila, Suman Kapila, Rohit Sharma, Vamshi Saliganti, Meena Kapasiya and Gulshan Dass

67. TECHNOLOGY OF SOUR DAHI USING PROLIFIC ACIDIFYING LACTIC CULTURES
   Pradip V. Behare, S. K. Tomar and Surajit Mandal

68. MISTI DOI WITH FAST ACIDIFYING HIGH SUGAR TOLERATING LACTIC CULTURE(S)
   Surajit Mandal, S.K. Tomar and Pradip V. Behare

69. COST EFFECTIVE FOOD GRADE MEDIUM FOR LACTOBACILLUS SP.
   Surajit Mandal and S.K. Tomar

70. DIRECT PRODUCT PROBIOTIC (DPP) FORMULATION OF LACTOBACILLUS CULTURE
   Surajit Mandal and S.K. Tomar

71. WHEY BASED MEDIUM FOR LACTIC ACID BACTERIA
   Surajit Mandal and S.K. Tomar

72. BIOPROCESS FOR DIRECT VAT SET (DVS) MISTI DAHI CULTURE
   Surajit Mandal, Sankara Rao N., Siddvinayaka, S.K. Tomar and Pradip V. Behare
73. **EXOPOLYSACCHARIDES PRODUCING LACTIC CULTURES FOR PREPARATION OF LOW-FAT LASSI** 63
   Pradip V. Behare, S.K. Tomar and Surajit Mandal

74. **EXOPOLYSACCHARIDES PRODUCING LACTIC CULTURE FOR PREPARATION OF LOW-FAT DAHI** 64
   Pradip V. Behare, Surajit Mandal and S.K. Tomar

75. **PROBIOTIC BACTERIAL CULTURE FOR PREPARATION OF FERMENTED MILK PRODUCTS FOR HEALTHY GUT** 65
   Rajeev Kapila and Suman Kapila

**Theme: Technologies for Nutrition of Dairy Animals**

76. **TOTAL MIXED RATIONS** 66
    S.S. Kundu

77. **MANUFACTURING PROCESS FOR FEED BLOCKS** 67
    S.S. Kundu

78. **AREA SPECIFIC MINERAL MIXTURE FOR DAIRY ANIMALS** 68
    Veena Mani

79. **DEGCURE MIXTURE FOR THE TREATMENT OF DEGNALA DISEASE** 68
    Chander Datt

80. **ANIONIC MINERAL MIXTURE FOR REDUCING POST PARTUM PROBLEMS IN CATTLE AND BUFFALOES** 69
    Veena Mani

**Other Technologies**

81. **BUFFALO MAMMARY EPITHELIAL CELL LINE (BUMEC_ND1)** 70
    A.K. Mohanty, J.K. Kaushik, Sudarshan Kumar and A.K. Dang

82. **A DEVICE FOR DIALYSIS OF SAMPLES IN MICROLITER VOLUME** 71
    Y.S. Rajput and Reena Sodhi

83. **A MULTIPURPOSE DEVICE FOR DIALYSIS, CONCENTRATION AND BUFFER EXCHANGE OF SAMPLES IN MICROLITER VOLUME** 72
    Y.S. Rajput and M.P. Divya

84. **NOVEL RNA ISOLATION METHOD FROM LIVER TISSUE OF RECALCITRANT ANIMAL SPECIES TO OBTAIN NGS (NEXT GENERATION SEQUENCING) QUALITY** 72
    Suneel Kumar Onteru, Dheer Singh, Davinder Sharma and Naresh Golla

85. **NOVEL RNA ISOLATION METHOD FROM ADIPOSE TISSUE OF RECALCITRANT ANIMAL SPECIES TO OBTAIN NGS (NEXT GENERATION SEQUENCING) QUALITY** 74
    Suneel Kumar Onteru, Dheer Singh, Davinder Sharma and Naresh Golla
NUTRIMIX

Ashish Kumar Singh, P.N. Raju, Amol Sahare, R.R.B. Singh and Sumit Arora

Dairy Technology Division
Email: aksndri@gmail.com, Phone: 9416292406

- Nutrimix is a low cost dry powdered nutritionally rich formulation which is developed by suitable processing of ingredients like pearl millet, barley and milk protein ingredients.

- This powdered product can be used as a reedy-to-reconstitute weaning food. And upon reconstitution it yields superior textural and flavour characteristics. The nutrimix is fortified with suitable iron and zinc salts without affecting the sensory and storage characteristics of the product.

- It can be serve as an ideal item for community feeding programmes.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
Process for manufacture of health promoting blueberry fortified probiotic dahi has been developed. Process parameters with respect to probiotic starters, blueberry levels and cultural growth conditions have been optimized. The novel features of the developed product are:

- Formulation contains well characterized indigenous probiotic strain (L. rhamnosus CRD11; Gene Bank Accession No. KJ769145) and processed blueberry which exhibits synergistic effect against progression of colon carcinoma as evidenced by biochemical, genetic and histo-pathological markers in animal model.
- The probiotic strain(s) used as starters possess health promoting & food safety attributes i.e. anti-mutagenic, antioxidant, hypocholesterolemic and antimicrobial against food borne pathogen/ spoilage microorganisms.
- Developed product has shelf life of 21 days at refrigeration storage temperature (5ºC) without any detectable changes in microbiological, chemical and sensory parameters.

**Sale price:** Rs. 5.00 lakhs + GST (with 2% royalty) and 6.50 lakhs + GST (without royalty).
TECHNOLOGY OF BHAPA DAHI

Kaushik Khamrui

Dairy Technology Division

Email: kkhamuri@gmail.com, Phone: 9991883555

- The technology is related to production of a fermented milk product with use of fermented milk concentrate mixing with two more ingredients.
- Upto three weeks days in refrigerated storage.

Sale price: Rs 0.50 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

TECHNOLOGY FOR PREPARATION OF CHOCOLATE BHAPA DOI

Kaushik Khamrui, Naveen Yadav and Writdhama Prasad

Dairy Technology Division

Email: kkhamuri@gmail.com, Phone: 9991883555

- Bhapa doi is a fermented-steamed sweet curd, commonly consumed in the eastern states of India.
- Traditionally it is prepared steaming a mixture of curd, milk solids and sugar.
- Increasing consumer awareness for health and nutrition has shifted the market demand for functional foods.
- Theobroma cacao is widely used in the preparation of varieties of chocolates.
- Recent studies have highlighted its functional attributes pertaining to its unique lipid profile and fibers.
- This technology includes standardized amount of ingredients (dahi, sugar, milk solids, chocolate) and the processing conditions required for preparation of bhapa doi.
• The developed product was acceptable by the dairy products sensory panelists and the consumer acceptance survey also revealed huge potential of the product.

Sale price: Rs. 2.00 lakhs + GST (without royalty) for 10 years non-exclusive term.

TECHNOLOGY FOR PREPARATION OF CURCUMIN ENRICHED GHEE

Kaushik Khamrui, Jui Lodh and Writdhama Prasad
Dairy Technology Division
Email: kkhamuri@gmail.com, Phone: 9991883555

• Ghee is one among the oldest dairy products consumed widely in the Indian peninsula.
• It is used in various food preparations and also is often consumed as such.
• The unique fatty acid profile of milk fat is responsible for its excellent nutritional and medicinal activities.
• However, due to limited shelf life and association of fats with cardiovascular diseases, its market demand is at risk.
• Curcumin, active compound of turmeric, is known for its anti-oxidative and health attributes.
• For its health promoting attributes, it is being increasingly used in different food products to increase their functionality.
• This technology includes standardized amount of curcumin and the processing conditions required for preparation of curcumin enriched ghee.
• The product has higher shelf life and functionality.
• Curcumin enriched ghee was acceptable to the sensory panelists and its consumer acceptance survey also revealed huge potential of the product.

Sale price: Rs. 2.00 lakhs + GST (without royalty) for 10 years non-exclusive term.

TECHNOLOGY FOR THE PREPARATION OF HIGH ANTIOXIDANT ACTIVITY BUFFALO CASEIN HYDROLYSATES

Rajesh Kumar, Rajeev Kapila, Nischal Mayur Ashok Rao, Somya, Gulshan Dass, Harisha Bodemala, Bimlesh Mann and Suman Kapila

Dairy Chemistry Division

Email: rbajaj1375@gmail.com; Phone: 9896138416

The highly unstable and reactive nature of free radicals and reactive oxygen species (ROS) in the body results in cell damage and consequently leads to diseases such as hypertension, cardiovascular, cancer, diabetes mellitus, and neurodegenerative and inflammatory diseases. Antioxidants protect the body by scavenging free radicals and ROS and also inhibiting lipid peroxidation reactions, thus preventing oxidative damage. The process for the preparation of buffalo casein hydrolysate enriched with low molecular weight peptides having potential antioxidative activity. The process comprises enzymatic system having endoprotease and/or exoprotease activity to the specified degree of hydrolysis. The buffalo casein hydrolysates with antioxidant activity 1600-2400 µmol trolox equivalent antioxidant capacity per mg of peptide content obtained after freeze drying or spray drying with 84% yield. Further, the hydrolysate preparation with 76% protein and low ash content, exhibit no cytotoxic effect and possess high solubility at low pH and reduced bitterness score. The preparation can be used as functional ingredient.

Sale price: Rs. 5.00 lakhs + GST (without royalty) for 10 years non-exclusive term.
Traditional *peda* has huge popularity among general populace, but being a fat and sugar rich sweet, it cannot penetrate in market of health conscious and diabetic populace.

Reduced calorie *peda* is replacement to the traditional *peda* available in the market and specifically designed for health conscious and diabetic populace who don't want to take much of the sugar and fat in the diet but also want to relish taste of traditional Indian sweets.

**Key Features:**

For Consumer:
- Contains ‘no added sugar’.
- 30% less calorie than the conventional *peda*

For producer:
- Increased demand of reduced calorie foods.
- Contains ingredients approved by food laws.
- Consumer survey: Good liking.

**Sale price:** Rs. 2.0 lakhs + GST (without royalty) for 10 years non-exclusive term.
WHEY JALJEERA DRINK
Ashish Kumar Singh, Sudhir Singh, G.R. Patil and R.R.B. Singh
Dairy Technology Division
Email: aksndri@gmail.com, Phone: 9416292406

- Thirst quenching beverage which is based on whey, unique blend of spices, sugar and acidifying agents.
- Product technology can be adapted to any level of production and does not require installation of any extra equipment in existing milk processing unit.
- Highly refreshing drink rich in calorie and antioxidants.

Sale price: Rs. 0.50 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

WHEY TAMARIND DRINK
Ashish Kumar Singh, Sanket Borad and R.R.B. Singh
Dairy Technology Division
Email: aksndri@gmail.com, Phone: 9416292406

- A thirst quenching beverage based on whey, with unique blend of tamarind.
- Product technology can be adapted to any level of production and does not require installation of any extra equipment in existing milk processing unit.
Highly refreshing drink rich with the sweet and sour taste of tamarind.

**Sale price:** Rs. 0.50 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

### WHEY MANGO DRINK

*Ashish Kumar Singh, Sudhir Singh, G.R. Patil and R.R.B. Singh*

*Dairy Technology Division*

*Email: aksndri@gmail.com, Phone: 9416292406*

- A whey based beverage with the flavour of mango.
- Product technology can be adapted to any level of production and does not require installation of any extra equipment in existing milk processing unit.
- Highly refreshing drink rich in calorie and antioxidants.

**Sale price:** Rs. 0.50 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

### BAJRA LASI

*Ashish Kumar Singh, Sudhir Tomar, S. K. Kanawjia and Yogesh Khetra*

*Dairy Technology Division*

*Email: aksndri@gmail.com, Phone: 9416292406*

- Bajra (Pearl millet) lassi is fermented beverage which is prepared by fermenting the composite base of “pearl millet and milk” with suitable starter cultures. The product delivers most of the nutrients in easily digestible and highly bioavailable form.
- The technology consisted of formulation of ingredients, level of starter culture and standardized unit operations. Being highly refreshing, bajra lassi would serve as a substitute for soft carbonated beverages. The product had a shelf-life of about 10 days when kept under refrigeration conditions. However, with certain technological modifications the shelf-life is enhanced.
up to 21 days without any detectable change in sensory, compositional and microbiological quality.

- Chemical composition of Bajra lassi is Fat- 0.65%, TS- 8.80%, Protein- 2.40%, Ash- 1.28% and it also contain calcium and iron in appreciable amounts.

- The technology can be adopted at small and industrial scale without any extra addition to existing plant and machinery. It also offers judicious use of skim milk and butter milk solids and ideal candidate for product diversification.

- Product can be packed easily in poly-packs and pet bottles.

- Large scale consumer survey carried out in collaboration with industry and entrepreneurs indicated overwhelming acceptability of the products.

**Sale price**: Rs. 1.00 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**MILK PROTEIN-ENRICHED BAJRA SNACKS**

*Ashish Kumar Singh, P.N. Raju, Sanket Borad and R.R.B. Singh*

*Dairy Technology Division*

*E-mail: aksndri@gmail.com, Phone: 0184-2259291*

- In recent past consumption of snack foods has increased significantly, however majority of snack foods are considered as calorie dense, salty and may contain compounds like monosodium glutamate (MSG).

- The formulation and processing technology of milk protein-enriched bajra snacks is developed. The
product contains processed pearl millet flour, corn/rice flour, suitable milk proteins and salt.

- The snacks are manufactured by employing the optimized extrusion processing conditions to yield a protein-enrich snack which can be consumed directly. The snack contains more than 12% protein and only 2% fat, besides providing digestible carbohydrate and minerals.

- The amount of fat is much less if compared with similar snacks available in market and almost double the amount of good quality protein.

**Sale price:** Rs. 0.50 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

### WHEY-SKIM MILK-MILLET BASED COMPLEMENTARY FOOD

*Ramesh Moda, Ashish Kumar Singh, P.N. Raju and R.R.B. Singh*

*E-mail: aksndri@gmail.com, Phone: 0184-2259291*

- Complementary feeding is critical factor in determining the health status and well-being of infant especially after 6 months of age. Majority of malnutrition related problem arise due to poor emphasis on complementary feeding.

- Formulation and technological parameters were optimized for the development of complementary food based on a blend of whey-skim milk-pearl millet flour, barley malt, maltodextrin and corn flour.
The blend was carefully dried spray or tray drying process to yield a powder, which can be easily reconstituted in water or milk into porridge or beverage. The product meets specifications laid down for milk-cereal based complementary foods for all macromolecules by FSSR (2010).

Sale price: Rs. 1.00 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

MILK PROTEIN-ENRICHED IRON FORTIFIED BAJRA BISCUIT

_Latha Sabikhi, Ashish Kumar Singh, Devang Jani, Gayatri and Sumit Arora_

_Dairy Technology Division_

_Email: lsabikhi@gmail.com, Phone: 9896075404_

- The biscuit is prepared by using a composite of bajra (pearl millet) flour, wheat flour, shortening, dairy ingredients (rich in milk proteins) and fortified with suitable iron salt. Application of dairy ingredients assists in substitution of wheat flour with pearl millet flour to the maximum extent.
- Optimized biscuits will provide 15.0% of calorie, 20% protein, 7.6% iron and 9% of daily calcium requirement of RDA per 100 g of product.
- Validation of biscuits in animal model indicated that its consumption resulted in approximately 25% and 75% increase in haemoglobin and serum ferritin level respectively. Apparent digestibility coefficient and retention of iron was significantly more in anemic mice as compared to control.
• Processing technology can be adopted with the existing infrastructure of bakery unit and can provide opportunity to diversify the product profile towards health foods.

Sale price: Rs. 0.75 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

TECHNOLOGY FOR PREPARATION OF SHELF STABLE, NUTRITIONALLY RICH SMOOTHIES USING DAIRY AND NON-DAIRY INGREDIENTS

Sathish Kumar, M.H., Latha Sabikhi, Thompkinson, Devarja, H.C. and Sumit Arora

Dairy Technology Division

Email: mhskumar@gmail.com, Phone: 9996079450

• Smoothies based on green gram/chickpea/ragi/sorghum flour along with a fruit (mango), vegetable (carrot), honey and milk sources, to provide adequate amount of minerals, vitamins and dietary fiber along with other macronutrients.

• The formulated product would provide a nutritious and convenient ‘grab-and-go’ breakfast option to consumers who do not have enough time to prepare the meal.

• A serving of 200 g (per bottle) product provides approximately, 16-22% and 15-21% (in adult men & women, resp.) of iron, 19-33% of calcium, 13-14% of vitamin A and 12-19% of dietary fibre of RDA.

• Provides a delicious, cost-effective balanced nutrition option to all segments of the society.

• A cost effective technology to make shelf-stable product for longer shelf life.

• The product had a shelf life of three and two months at 4°C and 30°C (room temperature), respectively.

• Technology consists of an easily adaptable processing steps.
• Adaptation to existing juice or dairy beverage manufacturing facility needs very little modification or addition of instruments.
• Product can be packed easily in PET bottles or glass bottles.

Sale price: Rs. 1.50 lakhs + Taxes (18.0%) with 2% royalty or Rs. 2.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

LOW-CALORIE AND FIBER FORTIFIED MISTI DAHI

P.N. Raju and Dharam Pal

Dairy Technology Division

Email: narender.p@icar.gov.in, Phone: 9896038983

Misti dahi is a sweetened variety of dahi popular mainly in the eastern region of India. Because of its pleasant caramel and sour taste cherished by all age groups, misti dahi is now being sold in various parts of the country. Besides its several useful virtues as a fermented dairy product, misti dahi contains varying amounts of fat and cane sugar which are causes of concern for calorie conscious and diabetic people. The new formulation is a low-calorie product with goodness of dietary fiber. The health benefits as validated in diabetic animal models revealed significant reductions in fasting blood glucose and total cholesterol levels.

• Contains about 19% less calories compared to conventional product.
• Contains permitted food additives.
• Fortified with dietary fiber.
• Proven benefits to meet diabetics’ requirement.

Sale price: Rs. 0.50 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
A PROCESS FOR IRON FORTIFICATION OF PANEER USING EDIBLE COATING

P.N. Raju, Parameshwar S. Jotarkar, Ashish Kumar Singh and Sumit Arora

Dairy Technology Division
Email: narender.p@icar.gov.in, Phone: 9896038983

• Technology relates to a process for manufacturing of paneer with enhanced iron content.
• The process improves nutritional quality of paneer especially in terms of iron and protein, the iron content of paneer increase upto threefold (on dry matter basis) and the protein content increases about 16% mainly due to whey protein.
• With no major equipment required and with simple process interventions, the manufacturers can adopt the developed process to attract health conscious consumers and reap the benefits.

Sale price: Rs.1.00 lakh + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

TECHNOLOGY FOR THE MANUFACTURE OF ALOE VERA SUPPLEMENTED PROBIOTIC LASSI

Shaik Abdul Hussain, G.R. Patil and R.R.B. Singh

Dairy Technology Division
Email: abdulndri@gmail.com, Phone: 9896668983

• Lassi with a combination of health enhancing ingredients viz. Aloe vera and probiotics may serve the needs of majority of people with multiple health problems.
• Beneficial effects of Aloe vera, probiotics and fermentation (lassi) are provided in a single food matrix.
• Supplementation of Aloe vera into probiotic lassi enhances the survivability of beneficial microorganisms.
• Bitterness of Aloe vera was masked, and good palatability was provided by the fermentation and sugar addition in lassi.

• High level of probiotic organisms can be maintained for longer time.

• A cost effective refreshing functional beverage with enhanced health attributes.

• The product had a shelf life of 12 days at 5-7°C.

• Technology consists of an easily adaptable processing steps.

• Product can be packed easily in polythene pouches.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

READY-TO-RECONSTITUTE KHEER MIX


Dairy Technology Division

Email: grpndri@gmail.com, abdulndri@gmail.com
Phone: 9466149003, 9896668983

• Safety and consumer convenience packaged in a pouch-in-carton.

• The product is shelf stable for 6 months at 30°C.

• Cost compares well with the conventional Kheer.

• Considerable marketing potential due to high quality, transportation convenience and cost competitiveness.

• Technology suitable for adoption by dairy entrepreneurs.
Sale price: Rs. 2.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

READY-TO-RECONSTITUTE RASMALAI MIX


Dairy Technology Division
Email: grpndri@gmail.com, abdulndri@gmail.com
Phone: 9466149003, 9896668983

- Great consumer convenience and time saving.
- Shelf stable for more than 4 months at ambient temperature.
- Can be marketed over long distances.
- Favourable cost calculation.
- Export potential, safety and quality.
- Considerable potential for adaptation by organized dairy industry.
**READY-TO-RECONSTITUTE BASUNDI MIX**

*Prateek Sharma, R.R.B. Singh, G.R. Patil and A.A. Patel*

**Dairy Technology Division**

*Email: grpndri@gmail.com, Phone: 9466149003*  
*Contact: email: abdulndri@gmail.com, Phone: 9896668983*

- Shelf stable at ambient temperature.  
- Marketable over long distances.  
- Offers great deal of consumer convenience.  
- Industrially adaptable process.  
- Cost competitive.

It can be reconstituted within 5 min by mixing with boiling water.

**Sale price:** Rs. 2.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

---

**LONG-LIFE MILK-CAKE**

*Anil Kumar, G.R. Patil, R.R.B. Singh and A.A. Patel*

**Dairy Technology Division**

*Email: grpndri@gmail.com, abdulndri@gmail.com*  
*Phone: 9466149003, 9896668983*

- Great consumer convenience in handling and storage.  
- Can be kept well for two months at ambient temperature.  
- Cost calculations commensurate with the convenience and safety it offers.

**Sale price:** Rs. 1.00 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
• Great export potential considering demand, safety and quality.
• Considerable scope and potential for adaptation by organized dairy plants.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

EXTENDED SHELF LIFE FUNCTIONAL PANEER

S.N. Rajkumar, R.R.B. Singh, G.R. Patil and A.A. Patel
Dairy Technology Division
Email: grpndri@gmail.com, abdulndri@gmail.com
Phone: 9466149003, 9896668983

• Good storage stability (Four months at refrigeration temperature).
• Higher yield and consistent quality.
• Superior nutritional value due to added dietary fibre, calcium and phytosterol.
• Energy efficient process.
• Potential for adoption by organized dairy industry.
• Can be commercialized to any scale of production by introducing minor modifications in the recommended process parameters.

Sale price: Rs. 2.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
LOW FAT OVEN BAKED GULABJAMUN


Dairy Technology Division
Email: grpndri@gmail.com, abdulndri@gmail.com
Phone: 9466149003, 9896668983

- Great consumer convenience in handling and storage.
- Reduced fat content.
- Light brown colour, soft texture.
- MAP packaging.
- Extended shelf-life.
- Safety ensured.
- Fat in the resulting gulabjamun is thus reduced to nearly half of that in the conventional product.

Sale price: Rs. 0.50 lakh + Taxes (18.0%) with 2% royalty or Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

ARJUNA HERBAL GHEE

Rajani Kant, G.R. Patil, R.R.B. Singh and A.A. Patel

Dairy Technology Division
Email: grpndri@gmail.com, abdulndri@gmail.com,
Phone: 9466149003, 9896668983

- A functional ghee.
- Extracts from Arjuna terminalia.
- Less energy requirement than the traditional process.
- Process can be adopted for large scale production.
- The product has colour, flavour and taste similar to the market ghee.

**Sale price:** Rs. 2.50 lakhs + Taxes (18.0%) with 2% royalty or Rs. 3.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**FUNCTIONAL QUARG CHEESE**

*S.K. Kanawjia, Yogesh Khetra and Kunal Kadiya*

*Dairy Technology Division*

E-mail: skkanawjia@rediffmail.com, Phone: 0184-2260938 (Res), 0184-2259251 (O)

- Quarg Cheese is a curd style unripened variety of Cheese.
- Ready to eat just after its manufacture.
- Low-fat to fat free product.
- Rich in protein and calcium.
- Soft, smooth texture, mildly acidic and clean in flavour.
- Best suited to cold dishes, sauces, soups, salad, casseroles etc.
- Ideal for carrying flavours.
- Extending high flavoured expensive ingredients such as nuts, dried fruits.
- Use as fillings in pancakes, pasta, dips, stuffing in meat, chicken, fish, Etc.
- Use as toppings on crackers, baked products, potato, etc.
Technology has been standardized for manufacture of quarg cheese from cow milk and buffalo milk. Quarg cheese is also enriched with dietary fibers such as soy, oat and inulin and phytosterols. Shelf life of quarg cheese is also enhanced using bio-preservatives to 42 days under refrigeration.

**Sale price:** Rs. 1.50 lakhs + Taxes (18.0%) with 2% royalty or Rs. 2.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**TECHNOLOGY FOR MANUFACTURE OF FETA CHEESE FROM COW/ BUFFALO MILK**

*S.K. Kanawjia, Sanjeev Kumar and Yogesh Khetra*

Dairy Technology Division

E-mail: skkanawjia@rediffmail.com,  
Phone: 0184-2260938 (Res), 0184-2259251 (O)

- Feta cheese is a semi-soft, white-brined cheese.
- Typical rich, tangy flavour, slight acidic and salty, firm and creamy texture, sliceable cheese.
- Rich in protein and calcium.
- Excellent product for vegetarians.
- Used as breadmate, salad dressing, soup, snacks preparations, baking etc.
- Demand is increasing particularly in Greek, Yugoslavia, Bulgaria, Middle-East countries, US & European countries.
- Feta cheese is traditionally manufactured from sheep milk and mixture of sheep & goat milk.
• In European countries, technique has been developed to manufacture Feta Cheese from cow milk.

• Typical character of cheese is white in colour, cow milk has to be bleached for desired white colour.

• Bleaching destroys valuable β-carotene.

• Technology developed for manufacture of Feta cheese from Buffalo Milk using Microbial Rennet.

• Excellent product for vegetarians.

• Feta Cheese has great export potential.

Sale price: Rs. 2.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

TECHNOLOGY OF A FUNCTIONAL MILK DRINK

Kaushik Khamrui and Nripendra Kumar Maurya

Dairy Technology Division

Email: kkhamuri@gmail.com, Phone: 9991883555

• The invention is related in production of fermented milk drink with enhanced functional attributes though incorporation of natural ingredients.

• If taken regularly, beyond the basic nutrition may provide therapeutic or preventive effects against senile degenerative disease like Alzheimer’s.

• Upto 10 days in refrigerated storage in PET bottles.

• Upto 3 weeks in refrigerated storage in LDPE film or PET bottles.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
TECHNOLOGY OF REDUCED FAT CHANNA BASED DAIRY SPREAD

Kaushik Khamrui and Kumar Amit Raj
Dairy Technology Division
Email: kkhamuri@gmail.com, Phone: 9991883555

- The invention is related in production of fermented milk drink with enhanced functional attributes though incorporation of natural ingredients.
- If taken regularly, beyond the basic nutrition may provide therapeutic or preventive effects against senile degenerative disease like Alzheimer’s.
- Upto 10 days in refrigerated storage in PET bottles.
- Upto 3 weeks in refrigerated storage in LDPE film or PET bottles.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

TECHNOLOGY OF LOW SODIUM PROCESSED MOZZARELLA CHEESE

Yogesh Khetra, S.K. Kanawjia and G.S. Meena
Dairy Technology Division
Email: yogeshndri@gmail.com, Phone: 9813902989

- The technology comprises replacement of sodium salts by other ingredients with an aim to reduce overall sodium in Mozzarella cheese.
- The product is developed to reduce dietary sodium consumption to prevent hypertension.

Sale price: Rs. 0.50 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
A PROCESS FOR THE PREPARATION OF LOW CHOLESTEROL GHEE

Darshan Lal, Vivek Sharma, Raman Seth, Manoj Kumar and Amit Kumar

Dairy Chemistry Division

Email: vishk12000@yahoo.com, Phone: 9416651314

NDRI-Karnal has developed a process for preparation of low-cholesterol ghee wherein the cholesterol removal rate of 85% has been claimed. Low-cholesterol ghee meets the standard physico-chemical parameters as specified for ghee under FSSAI, 2011 and AGMARK rules. The process has been developed in such a way that the final product has a flavour comparable to that of regular desi ghee. Low-cholesterol ghee may have good market potential at domestic as well as global level. Low-cholesterol ghee offers a healthy choice to the conscious consumers who want to restrict the dietary intake of cholesterol. The technology for low-cholesterol ghee has been patented (Patent Number: 257783; The Patent Office, Govt. of India).

Sale price: Rs. 5.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 6.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
ENZYMES MODIFIED CHEESE TECHNOLOGY

Bikash C. Ghosh and S. Jaydip Narotambhai
Dairy Technology Section, Southern Regional Station,
National Dairy Research Institute, Bengaluru
E-mail: ghosgoga@hotmail.com, Phone: 9449682212

Cheese flavour was developed under controlled condition from cheese with the application 2-3 types of enzymes. Flavour concentrate is in the paste form and made through enzyme modified cheese technology. Flavour concentrate can be used to enhance flavour either in Dairy or any non dairy food products. It can also used to mask un popular flavour of the foods. It has about 50 times more cheese flavour in concentrated form.

Sale price: Rs. 1.50 lakhs + GST (without royalty) for 10 years non-exclusive term.

TECHNOLOGY OF PREPARATION OF A REDUCED CALORIE NATURALLY CARBONATED SWEETENED FERMENTED DAIRY BEVERAGE

Sudhir Kumar Tomar, Falguni Patra and A.K. Singh
Dairy Microbiology Division
E-mail: sudhirndri@gmail.com, Phone: 0184-2259196

The present investigation encompasses preparation of a novel low calorie naturally carbonated functional dairy beverage with distinct sensory attributes. The technology is developed by coculturing Leuconostoc Ln27 and L. lactis subsp. lactis NCDC 90. The Leuconostoc Ln27 is a high mannitol producing native strain of Leuconostoc mesenteroides subsp. mesenteroides isolated and characterized from indigenous fermented milk products. The final composition of the product so developed is as follows: fat, 1.55 ± 0.05%; protein, 4.73 ± 0.25%; lactose, 4.25 ± 0.25%; sucrose, 5.7 ± 0.3%; mannitol 3.1 ± 0.17%; pH, 4.43 ± 0.02; titratable acidity 0.93 ± 0.026% and viscosity, 0.395 ± 0.004 centipoises. There is a 35% reduction in calorific value in developed product and has a shelf life of three weeks under...
refrigerated conditions. Besides, the product has a novel characteristic effervescent and tingling flavour owing to natural biofortification of product with carbon di oxide produced during fermentation of milk.

**Sale price:** Rs. 2.50 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

**STRAWBERRY WHEY DRINK**

*Shilpa Vij and Samlesh*

*Dairy Microbiology Division*

*Email: shilpavijn@yahoo.co.in, Phone: 9996262863*

Strawberry based whey drink is a probiotic drink. Includes the cost of culture maintenance, product preparation under controlled conditions. Whey is a byproduct of dairy industry which is having excellent nutritional, therapeutically and functional properties. Only 50% of the total whey produced in India is utilized and the rest 50% is discarded as such which causes tremendous pollution problem. Therefore, utilization of whey for preparation of Fermented drinks with probiotic bacteria and prebiotic could be an innovative alternative for the utilization of whey by dairy industries, without the need for great investment. The functional fermented probiotic whey drink has health promoting properties due to the probiotic bacteria as well as bioactive peptides produced from whey proteins. A process has been developed to produce a good health promoting soft beverage from this waste material.

- It has a good nutritional value
- It has therapeutic values namely:
Protection against gastro-intestinal disorders.
Bioavailability of vitamins and minerals.
It has health promoting properties like antioxidant, antihypertensive and antimicrobial properties.

- Shelf life: 2 weeks under refrigeration condition.
- It is much cheaper in cost compared to the other known and available beverages or carbonated drinks.

**Sale price:** Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**HEALTH PROMOTING SOY YOGHURT**

*Shilpa Vij and Deepika Yadav*

*Dairy Microbiology Division*

*Email: shilpavijn@yahoo.co.in, Phone: 9996262863*

Soy yoghurt is a probiotic fermented food. Includes the cost of culture maintenance, product preparation under controlled conditions. Soybean is highly nutritious food with presence of all the essential amino acids. Fermentation solves the problem of off-flavors and also enhances biofunctional components of soy. The functional fermented probiotic soy yoghurt has health promoting properties due to the probiotic bacteria as well as biofunctional properties of the soy milk. A process has been developed to produce a good health promoting soy yoghurt from the soymilk.
• It has a good nutritional value
• It has therapeutic values namely:
  ▶ Protection against gastro-intestinal disorders.
  ▶ It has antioxidative properties.
  ▶ It has cholesterol lowering properties.
  ▶ It has property to reduce blood pressure.
  ▶ It has immunomodulatory property.
• It has many health promoting properties like antioxidant, antihypertensive and antimicrobial properties.
• Shelf life: 2 weeks under refrigeration condition.
• It is much cheaper in cost compared to the milk yoghurt.

**Sale price:** Rs. 2.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**LACTOSE FREE SOY DAHI**

*Shilpa Vij and Subrota Hati*

Dairy Microbiology Division

*Email: shilpavijn@yahoo.co.in, Phone: 9996262863*

Soy dahi is a probiotic fermented food. Includes the cost of culture maintenance, product preparation under controlled conditions. Soy bean is nutritious and cheap, used to prepare soy based fermented milk products. Soy product consumption has increased because of their large beneficial properties such as being free of lactose, cholesterol and gluten. This product is also suitable for lactose intolerant population. The taste of soy milk can be improved by decreasing the beany, grassy or soy flavour by fermentation using lactic acid bacteria. A process has been developed for preparation of lactose free soy dahi. The soy dahi has many health benefits.

• It has a good nutritional value
• It has therapeutic values namely:
  ▶ Protection against gastro-intestinal disorders.
  ▶ It has antioxidative properties.
  ▶ Blood pressure lowering.
  ▶ It has cholesterol lowering properties.
• It is useful for lactose intolerant people.
• It is low fat product.

• Shelf life: 1 weeks under refrigeration condition.
• It is much cheaper in cost compared to the normal dahi.

Sale price: Rs. 2.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

PROBIOTIC WHEY DRINK WITH ANTIDIARRHEAL ACTIVITY

Shilpa Vij and Vandna

Dairy Microbiology Division

Email: shilpavijn@yahoo.co.in, Phone: 9996262863

Whey drink is a probiotic fermented drink. Includes the cost of culture maintenance, product preparation under controlled conditions. The WHO define diarrhea as three or more watery stools on two or more consecutive days. Probiotics have preventive as well as curative effects on several types of diarrhoea of different etiology. Probiotics are fast emerging as an alternative to conventional antimicrobial therapy. Whey is a good carrier of probiotics. Fermented whey also contributes in diarrhoea control due to the presence of whey proteins and peptides, whey electrolytes as well as the probiotic cultures. The present investigation was
undertaken to explore the possibility of using probiotic lactobacilli in fermented whey drinks for therapy against diarrhoea.

- It has a good nutritional value.
- It has therapeutic values namely:
  - Protection against gastro-intestinal disorders.
  - Bioavailability of vitamins and minerals.
- It can treat diarrhea.
- Shelf life: 2 weeks under refrigeration condition.

**Sale price:** Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**CURCUMIN SOY WHEY DRINK**

*Shilpa Vij and Deepender*

*Dairy Microbiology Division*

*Email: shilpavijn@yahoo.co.in, Phone: 9996262863*

Curcumin soy whey drink is a probiotic fermented drink. Includes the cost of culture maintenance, product preparation under controlled conditions. Soymilk is considered as a suitable economical substitute for cow’s milk and an ideal nutritional supplement for lactose-intolerant population. Fermentation improves the bioavailability of isoflavones, assists in digestion of protein, provides more soluble calcium, enhances intestinal health and supports immune system. Further addition of whey to soymilk increases therapeutic value. Supplementation of curcumin increases viability of fermented whey based soymilk as it has been used from ages as a medicinal herb in Asian countries. Also, as culture used are probiotic hence beneficial for our gut which modulate our gut microflora. Overall in fermented whey based soymilk beverage, its constituents are easily digestible which are in simpler form.

Benefits of fermented whey based soymilk beverage supplemented with curcumin.

- Fermented soy milk beverage is refreshing, nutritional, cost effective, biofunctional, health promoting.
• It has antimicrobial and antioxidant property.

• It is good in proteins both in the form of whey and plant protein.

• It has anti-inflammatory activity, antioxidant activity and antimicrobial activity due to curcumin.

**Sale price:** Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

---

**BIOFUNCTIONAL FRUIT YOGHURT**

Shilpa Vij and Jagrani Minj

Dairy Microbiology Division

Email: shilpavij@yahoo.co.in, Phone: 9996262863

• Improves healthy bacteria in the gut.

• Beneficial for reduction in high blood pressure & hypertension.

• Reduces oxidative stress and improves antioxidant enzymes level.

• It improves the immune system.

• Processing method is easy.

• Can be easily available to individual.

• Marketing demand is high due to many biofunctional role.

**Sale price:** Rs. 2.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
A new method has been developed for the detection of detergent in milk. The developed method requires addition of only 400 µl of milk to detecting reagent followed by inverting the tubes 20 times gently. The tube is then kept in upright position and colour of the lower phase is observed. Appearance of purple colour in the lower phase represents pure milk whereas blue colour in the lower phase indicates presence of detergent in milk. The results are available within 100 seconds and it can detect the presence of 20 mg commercial anionic detergent (LABOLENE) in 100 ml of pure milk. This qualitative test can be easily performed at milk collection canters. The method has been validated by Punjab Biotechnology Incubator, Mohali – a NABL accredited laboratory.

Sale price: Rs. 6.00 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.
Rs. 7.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
A NEW STRIP BASED TEST FOR DETECTION OF NEUTRALIZERS IN MILK

Rajan Sharma, Priyae Brath Gautam,
Y.S. Rajput and Bimlesh Mann

Dairy Chemistry Division
E-mail: rajansharma21@gmail.com,
Phone: 0184-2259532; 9416120181

A rapid paper based strip test has been developed for the detection of neutralizers in milk. The prepared strip is yellow in color. The test involves dipping of the strip in milk samples followed by immediate visualization of color of the strip. The color of the strip changes to green or deep blue depending on the amount of neutralizer in the milk while in pure milk samples, the strip retained its original yellow color. The test strip responds immediately when brought in contact with the milk samples. The color on the strip is stable for a few hours. The developed tests is more sensitive than the existing rosalic acid test and the strip can detect presence of NaOH, Na₂CO₃, NaHCO₃ at concentration of 0.03, 0.05, 0.1%, respectively in milk. Normal processing of milk such as pasteurization, boiling etc does not affect the efficacy of the strip. The shelf life of the strip is more than 6 months at room temperature. The test can be used at milk reception centres and also at household.

Sale price: Rs. 1.50 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
A NEW STRIP BASED TEST FOR DETECTION OF UREA IN MILK

Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput and Bimlesh Mann

Dairy Chemistry Division
E-mail: rajansharma21@gmail.com,
Phone: 0184-2259532; 9416120181

A rapid paper based strip has been developed for the detection of added urea in milk. The prepared strip is yellow in color. The test involves dipping of the strip in milk samples followed by visualization of color of the strip after 3 min. The color of the strip changes to dark red in urea adulterated milk samples while in pure milk samples, the strip color remains yellow. The intensity of the dark red color produced in the strip is proportional to the amount of urea present in the milk sample. Normal processing of milk such as pasteurization, boiling etc does not affect the efficacy of the strip. The developed strip can detect presence of more than 80 mg/100 ml of added urea in milk. The shelf life of the strip is more than 5 months at refrigeration temperature. The test can be used at milk reception centers and also at household.

Sale price: Rs. 1.50 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
STRIP BASED TEST FOR DETECTION OF GLUCOSE IN MILK

Rajan Sharma, Y.S. Rajput, Bimlesh Mann and Panchal Bhaveshkumar R

Dairy Chemistry Division

E-mail: rajansharma21@gmail.com, Phone: 0184-2259532

A rapid paper based strip test has been developed for the detection of glucose in milk. The prepared strip is white in colour. The test involves putting a drop of milk on the strip followed by visualization of change in colour of the strip. The colour change to pink after about 5 minute in case of milk is adulterated with glucose. The intensity of pink colour produced in the strip is proportional to the amount of glucose present in milk sample. The test can detect presence of 0.04% level of glucose in milk. The test can be used at milk reception centers and also at house hold.

Figure: The change in colour of strip in pure and adulterated milk sample

Sale price: Rs. 1.50 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
A rapid paper based strip test has been developed for the detection of hydrogen peroxide in milk. The prepared strip is white in colour. The test involves putting a drop of milk on the strip followed by visualization of change in colour of the strip. The colour change to pink after about 1 minute in case of milk is adulterated with hydrogen peroxide. The intensity of pink colour produced in the strip is proportional to the amount of hydrogen peroxide present in milk sample. The test can detect presence of 0.001% level of hydrogen peroxide in milk. The test can be used at milk reception centers and also at household.

Figure: The change in colour of strip in pure and adulterated milk sample

Sale price: Rs. 1.00 lakh + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms or

Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
STRIP BASED TEST FOR DETECTION OF MALTODEXTRIN IN MILK

Rajan Sharma, Y.S. Rajput, Bimlesh Mann and Panchal Bhaveshkumar R

Dairy Chemistry Division

E-mail: rajansharma21@gmail.com, Phone: 0184-2259532

A rapid paper based strip test has been developed for the detection of maltodextrin in milk. The prepared strip is white in colour. The test involves putting a drop of milk on the strip followed by visualization of change in colour of the strip. The colour change to yellow after about 3 minute in case of milk is adulterated with maltodextrin. The intensity of yellow colour produced in the strip is proportional to the amount of maltodextrin present in milk sample. The test can detect presence of 0.15% level of maltodextrin in milk. The test can be used at milk reception centres and also at household.

![Figure: Change in colour of strip in presence of different levels of maltodextrin in milk](image)

**Sale price:** Rs. 2.25 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

Rs. 3.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
A STRIP BASED TEST FOR DETECTION OF SUCROSE IN MILK

Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput and Bimlesh Mann

Dairy Chemistry Division

E-mail: rajansharma21@gmail.com, Phone: 0184-2259532

A rapid strip based test for detection of sucrose in milk has been developed. The developed strip test can detect 0.1% sucrose in milk. The working of the strip involves placing a drop of milk on the developed strip and observing the change in colour after 5 min. The strip is white in colour and in case of milk adulterated with sucrose changes to pink colour. The intensity of developed pink colour is proportional to extent of sucrose in milk. In case of pure milk, the strip retains its original white colour. The test is convenient to do and can be easily done at milk collection center as well as at household level. The technology of the strip is available from NDRI on commercial basis and for further information, Institute Technology Management Unit (ITMU) may be contacted.

Sale price: Rs. 1.50 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

Figure: Working of the sucrose detection strip. The development of pink colour indicates presence of sucrose in milk
PAPER STRIP ASSAY FOR RAPID DETECTION OF PESTICIDE RESIDUES

Naresh Kumar, N. Tehri, R. Gopaul, P. K. Sharma, Morab S. and Raghu H. V.

Dairy Microbiology Division
E-mail: nrshgoyal@yahoo.com Ph. 0184-2259187

Pesticides are well known carcinogen and their impact on human beings and presence in different food products including milk are well known in the prior art. The existing conventional chromatographic methods (LC/GC-MS) are time-consuming and laborious. Currently, new standards for pesticides have been developed by FSSAI and implemented for regulatory compliance in different food products including milk. For routine monitoring of pesticides under field application, three stage assay on paper strip has been developed based on “spore germination and enzyme inhibition principle". In case where analyte i.e. pesticide is absent, specific marker enzyme (s) are produced by spores during germination which will act specifically on chromogenic substrate resulting in coloured end product on paper strip, whereas complete inhibition of marker enzyme will take place when pesticides are present in food sample (Patent Reg. 3819/DEL/2015). Simple and cost-effective technology for field application especially at reception dock in dairy/food industries

- Paper strip assay is based on novel approach of exploiting spores as bio-recognition elements with marker enzyme (s) from prokaryotic system which otherwise is acetycholinesterase sourced from eukaryotic system.
• Spore based approach is unique IP and has been attempted for the first time in India and abroad.

• In current approach, there is no need for purification of enzyme and its stability in spores has been established upto 7-8 months at 4˚C.

• Paper strip assay can detect organophosphorous and Carbamate Groups of pesticide at 1-10 ppb limit with great degree of repeatability and selectivity.

• Extraction protocol of pesticide from milk has been optimised and working well with developed assay.

• Assay can be explored for field application for routine as well as for regulatory compliance of pesticides.

• Assay is rapid, cost effective, robust, reproducible, sensitive and selective when compared with conventional chromatographic techniques.

Sale price: Rs. 5.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 7.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**PAPER STRIP BASED ASSAY FOR DETECTION OF ANTIBIOTIC RESIDUES IN MILK**

*Kumar N, Anand, S. P., Shukla R., Suman, Sharma, P. K. and Raghu H.V.*

*Dairy Microbiology Division*

E-mail: nrshgoyal@yahoo.com, nkg6825@gmail.com
Ph: 0184-2259187 / 2259171

Paper-based sensors are new alternative technology for fabricating simple, low-cost, portable and disposable analytical devices for many application. The major advantages of using paper as a sensing platform include ease of availability, low cost, passive liquid transport, compatibility with chemicals/bio-chemicals and fast response. With these basic properties in mind, spore-germination inhibition based assay for antibiotic detection was developed on paper strip for exploring its potential under field application. The stages involved in developing paper sensors includes the proper choice of paper, fabrication/patterning and semi-quantitative analysis based on color development as a result
of specific marker enzymes released during spore germination. The test involves pre-dipping of strip in milk and germination of spores in presence of germinant mixture when incubated at 64°C for 1 hr. Development of blue color on paper strip indicates absence of antibiotic residues and no color development indicates presence of antibiotic residues in milk.

- Semi-quantitative detection of β-Lactams, aminoglycosides, tetracycline, macrolides, chloramphenicol and sulfa drugs at Codex / EU limits.
- Assay is cost effective, rapid, robust, reproducible, selective & sensitive to larger group of antibiotic residues.
- Third party Validation from NABL accredited lab M/s. Dove Research and Analytics, Panchkula (A Unit of Dove Chemicals) Certificate no. DRA/NDRI/16-17/080217/002.
- Minimal false positive / negative results.
- Consistency in color development within 1 hr.
- No interference of inhibitors other than antibiotic residues.
- Stability of test kits up to 7 months under refrigeration storage.
- Field application for routine monitoring of antibiotic residues in raw milk, pasteurized milk and dried milk.

**Sale price:** Rs. 5.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 7.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
TECHNOLOGY TO PREPARE A KIT FOR THE DETECTION OF VEGETABLE OIL/ FATS IN GHEE

Vivek Sharma, Anupama Rani and Sumit Arora

Dairy Chemistry Division

Email: vishk12000@yahoo.com, Phone: 9416651314

Ghee consists of 98-99% triglycerides and this very composition of ghee is being exploited by unscrupulous traders to adulterate ghee with concoction of oils/ fats. The existing physico-chemical constants specified in FSSR are not fool proof to counter this malpractice of ghee adulteration. Therefore a Thin layer chromatographic (TLC) methodology has been developed to check the presence of vegetable oils/ fats in genuine ghee. Here, a procedure to prepare the ready to use kit has been developed, so that dairy industry can use the kit to counter this malpractice.

- Developed methodology is tracer component based so more confirmatory and fool proof.
- Time taken is 1 hr.
- Test demonstration video to make it convenient to use the kit in any dairy plant.

A: cholesterol+β- sitosterol
B: Pure ghee
C: 1% vegetable oil in ghee
D: 2% vegetable oil in ghee
E: 5% vegetable oil in ghee

Sale price: Rs. 3.00 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms or Rs: 3.50 lakhs + Taxes (18.0%) without royalty for 10 years on non-exclusive basis.
DETECTION OF BUFFALO MILK IN COW MILK USING HANSA TEST SERUM

Archana Verma

Animal Genetics and Breeding Division

E-mail: archana.ndri@gmail.com; Phone: 9416079659

• This technology is based on immunological principle i.e. antigen-antibody reaction. The test has been named as HANSA TEST and involves preparation of buffalo casein, immunization of rabbits and testing the titre of the antiserum.

• Adulteration of buffalo milk in cow milk (or any other milk) can be detected with accuracy.

• The test is rapid (only 30 seconds for one lot of milk).

• Only one drop of antiserum is required to test whole lot of milk. The test may be applied for milk products as well with same accuracy.

• Benefit of pricing policy may be obtained by cow breeders.

a) Positive Test i.e. Agglutination confirms the sample is either buffalo milk or admixed with buffalo milk

b) Negative Test i.e. No agglutination confirms pure cow milk.

Sale price: Rs. 2.50 lakhs+ GST (royalty) and 4.00 lakhs (without royalty) for 10 years non-exclusive term.
METHODOLOGY TO CONFIRM THE PRESENCE OF LARD IN GHEE

Vivek Sharma, Tanmay Hazara, Sumit Arora, Rekha Sharma and Sachinandan De

Dairy Chemistry Division

Email: vishk12000@yahoo.com, Phone: 9416651314

Lard is one adulterant fat which is commercially available in the refined form. Unscrupulous traders involved in the trading of ghee are using concoctions of different fats to adulterate ghee and cheating the consumers both ethically as well as economically. The existing chromatographic based methodology are not capable of confirming the type of clarified body fat in ghee, therefore a methodology has been developed to isolate DNA from lard containing ghee and subsequently its downstream application in a species specific simplex polymer chain reaction to confirm the presence of lard in ghee.

- Fast and simple DNA extraction (No hassles of preparing DNA isolation reagents in the laboratory).
- Entire procedure is completed within 5-6 hrs.
- Lard adulteration in ghee to the tune of 10% can be established

Fig. Lane1: 100 bp DNA ladder, Lane2: Ghee +20% lard, Lane3: Ghee +10% lard, Lane 4: Ghee +05% lard, Lane 5: Ghee, Lane 6: Negative control

Sale price: Rs. 2.50 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms or Rs. 3.00 lakhs + Taxes (18.0%) without royalty for 10 years on non-exclusive basis.
Two-stage enzyme based assay has been developed for detection of *L. monocytogenes* based on the principle of targeting “enzyme-substrate reaction for specific marker enzyme(s) to release free chromogen that can be visually detected by color change (Patent Reg. 1357/DEL/2013). The assay can confirm the presence of *L. monocytogenes* within real time of 4.30±0.10 h after initial pre-enrichment of food samples in novel selective medium i.e., LSEM for 24h as against 5-7 days protocol following conventional method (ISO: 11290 Part-1: 1996) The detailed test procedure & result interpretation is depicted in Fig.1 & 2.

- Color change from yellow to black in Stage-1 indicates the presumptive detection of *Listeria* spp. in 24±0.3h at 1.2 log cfu levels for 25g / or 22±0.3h per g of the milk sample.
- The color change from off white to green in Stage-2 in T-1 indicates the confirmation of *L. monocytogenes* and yellow color in T-2 indicates *Listeria* spp.
- Rapid detection within one working day as against 5-7 days required in conventional method.
- Selective inhibition of contaminants other than *Listeria* spp like *Enterococci*, *B. cereus*, *S. aureus*, *Lactobacilli*, *Salmonella* and *E. coli* etc.
• Internal / third party Validation of Technology at M/s SGS India Pvt. Ltd, Gurgaon, Certificate no. SGS GG12-009772.001 dated 09-11-2012.

• Two stage assay can be used for regulatory compliance of food samples including raw, pasteurized, dried milk and other food products as specified in FSS Act. 2015.

• Cost effective (Rs 75/- test as against Rs 762/- in conventional method).

• Animal disease surveillance / risk assessment work in organized dairy farms.

Sale price: Rs. 5.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 7.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**TWO STAGE ENZYME ASSAY FOR DETECTION OF ENTEROCOCCI IN MILK AND MILK PRODUCTS**

*Naresh Kumar, G. Kaur, G. Thakur, Raghu H. V., N. A. Singh, N. Raghav and V. K. Singh*

*Dairy Microbiology Division*

*E-mail: nrshgoyal@yahoo.com Ph. 0184-2259187*

The technology involves application of specific enzymatic reaction in selective medium. The marker enzyme which participates in unique biochemical pathways of specific genera or strain hydrolyze chromogenic substrate complex and release free chromogen which can be detected visually by color change. Currently, commercially available media like citrate azide agar requires an incubation period of 72-96 h for detection of Enterococci in milk. The current investigation was carried out keeping in consideration that current techniques for enumeration of hygiene indicators are time consuming and industry is looking forward for rapid assay. The developed technology is two stage enzyme assay for detection of Enterococci within 18±1.0h of incubation at 37°C in stage-1 employing EBSAM as selective medium in lyophilized form and its confirmation within 3:30 ±0.30h in stage-2 using specific enzyme substrate mixture (Patent Reg.119/DEL/2012).
• Appearance of black color in stage-1 indicates presumptive presence of *Enterococci* in milk.

• Appearance of yellow and orange color in T-1 & T-2 respectively in stage-2 confirms the presence of *Enterococci* in milk sample as depicted in the above fig.

• EBSAM medium is highly selective and specific for the growth of *Enterococci* and allow its detection in single working day.

• Developed assay can detect 1.0 log *Enterococci* counts in milk within 18.0 ±1.0h of incubation at 37 °C based on appearance of black color.

• The technology has potential to replace the existing medium for *Enterococci* for being cost effective (Rs 98.3 per liter as against Citrate azide agar (CAA) available @ Rs 262.5 per liter, Bile Esculin azide agar available @ Rs 493.5per liter.

• The working performance of enzyme based bio-assay was validated in house laboratory with IS: 5887 Part-2 (3-days protocol).

• Technology was validated at NABL accredited laboratory.

• Wide scope of application to raw, pasteurized and dried milks for routine as well as for regulatory standard compliance.

**Sale price:** Rs. 3.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 3.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
SPORE BASED KIT FOR DETECTION OF ANTIBIOTIC RESIDUES IN MILK AT DAIRY FARM

Naresh Kumar, A Khan, S Arora, Raghu H V, M Balhara, P K Sharma and S Shaikh

Dairy Microbiology Division
E-mail: nrshgoyal@yahoo.com Ph. 0184-2259187

The developed technology is working on principle of spore germination and its inhibition in presence of antibiotic residues in milk. In case when antibiotic residues are absent in milk, marker metabolites are released during germination which change the color of the indicator. However, in presence of antibiotic residues in milk, the spore germination process is inhibited at ≥ MRL level of contaminants and no change in color indicates the presence of drug residues in milk when incubated at 64°C for 2.30 hrs.

Result interpretation: Color changes from purple to yellow indicates absence of antibiotic residues while persistence of purple color indicates presence of antibiotic residues ≥ MRL level.

- The Cost effective (Rs 35 per test).
- Semi-quantitative detection of β-Lactam group, aminoglycosides, tetracycline, chloramphenicol, macrolides and sulfa drugs at Codex MRL.
- Validated with AOAC approved Charm 6602 Assay.
- Minimal false positive / negative results.
• No interference of inhibitors other than antibiotic residues.

• Stability of test kits up to 12 months under refrigeration storage.

• Test kit can be applied at dairy farm, milk collection center, dairy reception dock and R&D institutions etc.

**Sale price:** Rs. 3.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 4.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**RAPID TEST FOR DETECTION OF E. COLI IN MILK**

*Naresh Kumar, Ramakant L, Avinash, Bhawna A, Raghu H.V., M. Balhara, S Kadyan and V. Kumar*

*Dairy Microbiology Division*

*E-mail: nrshgoyal@yahoo.com Ph. 0184-2259187*

“Two-stage test” has been developed for detection of *E. coli* based on the principle of targeting “enzyme substrate reaction for specific marker enzyme (s) to release free chromogen in stage-1 which can be visually detected by a color change after 12±1.0h of incubation in *E. coli* selective medium as depicted in Fig:1. In stage-2 using specific enzyme substrate mixtures, confirmation of *E. coli* can be achieved within 3.00±0.15h as shown in Fig 2. The developed test can be used in dairy industry for routine detection of *E. coli* in milk and milk products for regulatory compliance (Patent Reg. 2214/DEL/2014).

• Appearance of blue color in Stage-1 indicates presumptive presence of *E. coli* as depicted in fig. 1.

• Appearance of blue color in Stage-2 confirms the presence of *E. coli* as depicted in fig. 2.
• The developed enzyme assay for *E. coli* can confirm <1.0 log cfu/ml within 12.0±1.0h for presumptive detection and 3.0±0.15h for its confirmatory detection as against 4 days protocol followed in conventional method (IS: 5887 Part-1: 1976).

• Novel medium is selective in terms of inhibition of contaminants like Salmonella, Shigella, Yersinia, Proteus, Serratia, Citrobacter, Enterobacter, *L. monocytogenes*, *B. cereus*, *S. aureus*, *L. casei* other than *E. coli* spp.

• Two stage assay can be used for regulatory compliance of food samples including raw, pasteurized, dried milk and other food products as specified in FSS Act. 2015.

• Lab Validation of developed kit with IS: 5887 Part-1:1976 using raw, pasteurized and dried milk.

**Sale price:** Rs. 5.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 7.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**RAPID TEST FOR DETECTION OF COLIFORMS IN MILK**

*Naresh Kumar*, *Ramakant L, Avinash, Bhawna A, Raghu H.V., M. Balhara, S Kadyan and V. Kumar*

*Dairy Microbiology Division*

*E-mail: nrshgoyal@yahoo.com Ph. 0184-2259187*

Coliforms are considered as fecal indicator organisms which indicates the presence of other potential harmful, disease-causing organisms / pathogens in milk and milk products. Technology for detection of coliforms has been developed involving targeting enzyme-substrate reaction for specific marker enzyme (s) to release free chromogen which can be visually detected by a color change within 12.15±0.30h of incubation employing CSM as selective medium in lyophilized form. The developed assay is of immense importance for food industry in rapid detection of Coliforms which otherwise are monitored by conventional ISO 4832:2006 methods requiring 48h using plate method /

- Appearance of yellow color confirms presence of coliforms as depicted in above.
- The developed enzyme assay for coliforms can confirm <1.0 log cfu/ml within 12.15±0.30 h of incubation as against 2-3 days protocol following conventional method.
- Selective inhibition of non-coliforms like Salmonella, Shigella, Yersinia and Proteus.
- Wide scope of application to raw, pasteurized and dried milks for routine as well as for regulatory standard compliance.
- Lab Validation of developed kit with ISO 4832:2006 using raw, pasteurized and dried milk.

Sale price: Rs. 2.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 2.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**DNA BASED METHOD FOR DIFFERENTIATION OF COW, BUFFALO, SHEEP, GOAT AND CAMEL MILK**

Sachinandan De, Sushil Kumar and Devika Goutam

Animal Biotechnology Centre

Email: sachinandan@gmail.com, Phone: 9416483670

Cattle produce 83% of world milk production, followed by buffaloes with 13%, goats with 2%, sheep with 1% and camel with 0.3%. The remaining share is produced by other dairy species such as equines and yaks. About one-third of
the milk production in developing countries comes from buffaloes, goats, camels and sheep. In developed countries, almost all milk is produced by cattle.

This is an innovative process for the isolation of milk somatic cells. The invention relates to a process for purifying and isolating milk somatic cells from raw and packed milk. Subsequently nucleic acids are isolated from the milk somatic cells. The basis of the invention is a method of isolation and disruption of the milk somatic cells, protecting the nucleic acids and finally purifying them. The isolated DNA was processed further for tracking their origin of species by PCR.

**Sale price:** Rs. 6.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**DNA BASED METHOD FOR DIFFERENTIATION OF COW, BUFFALO, SHEEP, GOAT AND PIG MEAT**

*Sachinandan De, Sushil Kumar and Devika Goutam*

*Animal Biotechnology Centre*

*Email: sachinandan@gmail.com, Phone: 9416483670*

The invention relates to a process for isolation of DNA from any tissue. The nucleic acid may contain impurities and many enzymatic inhibitors. The invention describes a detailed procedure and reagents for carrying out the said
method without any PCR inhibitors. The isolated DNA was processed further for use in PCR for identification of their origin like, cow, buffalo, sheep, goat and pig.

**Sale price:** Rs. 8.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

### APTAMER FOR AFLATOXIN M1

**Y.S. Rajput, Shilpi Malhotra and Rajan Sharma**

Animal Biochemistry Division

*Email: ys_rajput@rediffmail.com, Phone: 9466653595*

- Aptamers specific to aflatoxin M1 have been generated.
- These aptamers have different structural motif.
- The dissociation constants of aptamer-aflatoxin are in nano molar range indicating their higher affinity and thus industrially useful for developing methods for detection/estimation of aflatoxin in feed/food.
- These aptamers are of commercial value by making strategic use for mitigating aflatoxin toxicity and in removal of aflatoxin from feed/food.

**Sale price:** Rs. 4.00 lakhs + Taxes (18.0%) with 2% royalty extra on sale price for 10 years non-exclusive terms.

### APTAMER FOR BETACASOMORPHIN-7

**Y.S. Rajput, Abhishek and Rajan Sharma**

Animal Biochemistry Division

*Email: ys_rajput@rediffmail.com, Phone: 9466653595*

- Aptamers specific to betacasomorphin7 (BCM7) have been generated.
- These aptamers have different structural motif.
- The dissociation constants of aptamer-BCM7 are in nano molar range indicating their higher affinity for target.
- The aptamers can be used as recognition elements for developing methods for detection of BCM7 in urine.
and blood as well as for ascertaining whether milk is A1 or A2 in nature.

- These aptamers can also be used as therapeutic agent for overcoming effect of BCM7.
- Patent filed (No: 3703/DEL/2013)

**Sale price:** Rs. 2.00 lakhs + Taxes (18.0%) with 2% royalty extra on sale price for 10 years non-exclusive terms.

**Theme: Innovative Dairy Equipments**

---

**COOLING SYSTEM FOR VISCOUS DAIRY PRODUCTS**

I.K. Sawhney, P.S. Minz, Anshuman Raj Gurjar and Avijit Shaw  
Dairy Engineering Division  
Email: psminz@gmail.com Phone : 0184-2259281

- Is suitable for cooling of viscous dairy products immediately after production like khoa, rabri, basundi etc.
- The operating parameters have been optimized for different product for obtaining optimal performance with regard to heat transfer coefficient (U-value), cooling rate, and cooling efficiency.
- Capacity 60 kg khoa/h and can be scaled up for higher capacities.

**Sale price:** Rs. 7.50 lakhs + GST (without royalty) for 10 years non-exclusive term.
PILOT PLANT IN-LINE SYSTEM FOR MANUFACTURE OF TRADITIONAL INDIAN DAIRY PRODUCTS

P.S. Minz, I.K. Sawhney, Birkram Kumar and S.P. Agarwal

Dairy Engineering Division

Email: psminz@gmail.com Phone: 0184-2259281

- Semi automatic system suitable for production of multiple traditional Indian dairy products like khoa, burfi, basundi, rabri and ghee (cream and butter method).
- Integrated system consisting of scraped surface heat exchanger (SSHE) and conical process vat (CPV).
- Meets the requirement of small and medium entrepreneurs handling 500 to 2000 litres of milk per day for manufacture of various Indian dairy products with the same set of equipments.
- Unit operations based approach for proper development of texture and flavour.
- Hygienic design and system can be C.I.P. cleaned.
- Capacity: 60-120 litres milk/h.

Sale price: Rs. 8.00 lakhs + GST (without royalty) for 10 years non-exclusive term.
PROTOTYPE OF IMPROVED BUTTER MELTING SYSTEM

I.K. Sawhney, Aswin Warrier and P.S. Minz

Dairy Engineering Division

Email: psminz@gmail.com Phone: 0184-2259281

- Industrial butter melter currently used in the dairy processing industry is a network of pipes heated by hot water or steam and butter blocks are kept over the pipes for melting. The limitations of existing system is that it is labour intensive, has poor heat transfer rate and the process is time consuming.
- After extensive study the pipe network was redesigned with extended surface to improve the thermal performance of butter melter.
- The system helps to reduce the manual labour in butter cutting.
- Trials on prototype indicated that the butter melting capacity can be increased by 2-3 times using the improved design.

Sale price: Rs. 3.00 lakhs + GST (without royalty) for 10 years non-exclusive term.

CONICAL PROCESS VAT (CPV)

S.P. Agarwal, I.K. Sawhney, Birkram Kumar and P.S. Minz

Dairy Engineering Division

Email: psminz@gmail.com Phone: 0184-2259281

- Is suitable for heating, concentration and mixing operations.
- Straight line heat transfer surface suitable for positive scapping.
- Scapping mechanism with spring loaded blades.
- Propeller discharge for viscous products.
- Hygienic design and can be CIP cleaned.
- Capacity: 80 kg.

Sale price: Rs. 5.00 lakhs + GST (without royalty) for 10 years non-exclusive term.
SINGLE STAGE SCRAPED SURFACE HEAT EXCHANGER

P.S. Minz, I.K. Sawhney and Birkram Kumar
Dairy Engineering Division
Email: psminz@gmail.com Phone : 0184-2259281

- Is suitable for heating and concentration of milk.
- Provision to vary the scraper speed as per required.
- Can be operated in recirculation mode.

- Hygienic design and can be CIP cleaned.
- Capacity 80 kg/h.

Sale price: Rs. 5.00 lakhs + GST (without royalty) for 10 years non-exclusive term.

Theme: Innovative Dairy Culture

PROBIOTIC BACTERIAL CULTURE FOR PREPARATION OF FERMENTED MILK PRODUCTS WITH IMMUNO MODULATORY ATTRIBUTES

Rajeev Kapila, Suman Kapila, Rohit Sharma, Vamshi Saliganti, Meena Kapasiya and Gulshan Dass
Animal Biochemistry Division
Email: rkapila69@rediffmail.com, Phone : 9416392519

- Probiotic culture belongs to the group of lactic acid bacteria and genus Lactobacillus.
- Culture can grow under aerobic conditions.
- It has bile tolerance, acid tolerance and good hydrophobicity for staying in gut.
• It has potential to improve immune homeostasis and anti-oxidative status during aging as determined on mouse model.

• It has tendency to resist growth of E.coli as determined through in vivo and in vitro trials.

• The culture has also been trial tested in mice model for avoidance of food allergy sensitization in newborns if fed to mothers during suckling and offspring during post weaning periods.

• Safety assessment of this culture has also been conducted under in vivo trials on mice.

• The culture has already been deposited in Microbial Type Culture Collection (MTCC), IMTECH, Chandigarh under Budapest treaty.

**Sale price:** Rs. 5.00 lakhs + GST, without royalty on non-exclusive basis for 10 years; or USD 15000 + GST, without royalty on non-exclusive basis for 10 years.
TECHNOLOGY OF SOUR DAHI USING PROLIFIC ACIDIFYING LACTIC CULTURES

Pradip V. Behare, S. K. Tomar and Surajit Mandal
Dairy Microbiology Division
Email: pradip_behare@yahoo.com, Phone: 8295726103

Dahi accounts for 90% of the total cultured milk products produced in India. About 7% of the total milk produced is utilized for dahi making. Sour dahi is produced in many parts of the India especially for preparation of Kadhi, curd rice and other traditional foods. Numbers of dairy processors have evinced interest in availability of prolific acid producing dairy cultures for production of sour dahi on large scale.

The invention is related to production of sour dahi/curd using high acidifying lactic cultures. Two defined high acidity and exopolysaccharides producing cultures are incorporated in such a way that the resultant dahi is firm and highly acidic. While the production of high acidity ensures production of sourness, the exopolysaccharides additionally improves sensory attributes of dahi.

Sale price: Rs. 1.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
MISTI DOI WITH FAST ACIDIFYING HIGH SUGAR TOLERATING LACTIC CULTURE(S)

Surajit Mandal, S.K. Tomar and Pradip V. Behare
Dairy Microbiology Division
E-mail: mandalndri@rediffmail.com, Phone: 9991423316

- The invention is related in production of improved quality Misti Doi using fast acidifying high sugar tolerating lactic culture(s).
- Standardized protocol for preparation of milk-sugar-caramel mixture for improved quality Misti Doi.
- Intervention through use of defined strain of well characterized lactic culture(s).
- Yields a curd with improved body and texture free from wheying off.
- Free from post acidification during storage.
- Shelf life of developed Misti Doi is 18-20 days under refrigeration conditions.

Sale price: Rs. 1.60 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

COST EFFECTIVE FOOD GRADE MEDIUM FOR LACTOBACILLUS SP.

Surajit Mandal and S.K. Tomar
Dairy Microbiology Division
Email: mandalndri@rediffmail.com, Phone: 9991423316

- Invention relates in formulation of cost effective food grade medium for Lactobacillus spp. for culturing and biomass production.
- A key feature of the invention is the use of whey - a potential dairy processing by-product/waste.
- Growth performances of Lactobacillus sp. in formulated whey based media are equivalent to MRS broth (commercial medium).
- Cost of medium: approx. 10 times less than the commercially available media.
• Dry formulation of medium is stable at room temperature.
• Medium is suitable for production of *Lactobacillus* spp. biomass at large scale.

**Sale price:** Rs. 5.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**DIRECT PRODUCT PROBIOTIC (DPP)**

**FORMULATION OF *LACTOBACILLUS* CULTURE**

*Surajit Mandal and S.K. Tomar*

Dairy Microbiology Division
Email: mandalndri@rediffmail.com, Phone: 9991423316

- Invention relates in development of bioprocess for production of *Lactobacillus* sp. biomass, harvesting and preservation in dried form.
- Optimized process for production of *Lactobacillus* sp. biomass under batch and fed batch scale fermentation.
- Standardized protocol for harvesting and preservation of cell biomass as freeze dried powder.
- Viable counts: 11 -12 log cfu/g; stable till 75 days at -20°C.
- Application study: in fermented and non-fermented dairy products (approx. $10^8$ cfu/ml of final product) and stable under refrigerated conditions.
- Concentrate *Lactobacillus* culture can be used as DPP.

**Sale price:** Rs. 7.50 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
WHEY BASED MEDIUM FOR LACTIC ACID BACTERIA

Surajit Mandal and S.K. Tomar

Dairy Microbiology Division

Email: mandalndri@rediffmail.com, Phone: 9991423316

- Invention relates to formulation of cost effective food grade medium for Lactic acid bacteria. A key feature of the invention is the use of whey - a potential dairy processing by-product/waste.

- Growth performances of Lactobacillus sp. in formulated whey based media are equivalent to MRS broth (media for Lactobacillus sp.), Streptococcus thermophilus and Lactococcus sp. in formulated whey based media are equivalent to M17 broth.

- Cost of the whey based media is less than the commercially available media for lactic acid bacteria.

- Dry formulation of medium is stable at room temperature.

- The developed whey based medium is suitable for culturing and production of lactic acid bacteria (Lactobacillus sp., S. thermophilus, Lactococcus sp.) biomass.

Sale price: Rs. 6.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

BIOPROCESS FOR DIRECT VAT SET (DVS) MISTI DAHI CULTURE

Surajit Mandal, Sankara Rao N., Siddivinayaka, S.K. Tomar and Pradip V. Behare

Dairy Microbiology Division

Email: mandalndri@rediffmail.com, Phone: 9991423316

- Technology for production of Misti dahi culture (Fast acidifying high sugar tolerating thermophilic lactic culture for Misti dahi) biomass, harvesting and preservation in dried form.
- Optimized process for production of *Misti dahi* culture biomass under batch scale fermentation, also suitable for fed batch scale fermentation.
- Standardized protocol for harvesting and preservation of cell biomass as freeze dried powder.
- Viable counts: 11 to 12 log cfu/g; stable till 90 days storage at -20°C studied.
- Textural, physiochemical, microbiological and sensory qualities of *Misti dahi* prepared using DVS are comparable with fresh propagated milk culture.
- Concentrate *Misti dahi* culture can be used for direct addition without further sub-culturing and propagation (DVS) to prepare good quality product (*Misti dahi/ Dahi* etc).
- Bioprocess is also suitable for thermophilic lactic culture(s).

**Sale price:** Rs. 5.00 lakhs + Taxes (18.0%) with 2% royalty or Rs. 7.00 lakhs + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**EXOPOLYSACCHARIDES PRODUCING LACTIC CULTURES FOR PREPARATION OF LOW-FAT LASSE**

*Pradip V. Behare, S.K. Tomar and Surajit Mandal*

*Dairy Microbiology Division*

*E-mail: pradip_behare@yahoo.com, Phone: 8295726103*

- The invention is related in production of low fat *Lassi* with improved quality using EPS* lactic culture(s).
- Standardized protocol for low fat *Lassi* with improved consistency and mouth feel without added stabilizer(s).
• Intervention through use of defined strain of well characterized high level of EPS$^+$ (250 mg/lit) lactic culture(s).

• Novel culture capable of producing polysaccharides yields Lassi with improved body, consistency, mouth feel and sensory attributes.

• Shelf life of developed Lassi is 12-15 days under refrigeration conditions without whey separation.

• This low calorie (light) thirst quenching fermented milk product is highly suitable for Indian tropical conditions and calorie conscious consumers.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**EXOPOLYSACCHARIDES PRODUCING LACTIC CULTURE FOR PREPARATION OF LOW-FAT DAHI**

*Pradip V. Behare, Surajit Mandal and S.K. Tomar*

*Dairy Microbiology Division*

*Email: pradip_behare@yahoo.com, Phone: 8295726103*

• Defined strain of well characterized high level EPS producing lactic culture.

• Fast acidifying EPS$^+$ lactic culture for manufacture of low-fat dahi with improved quality, prevent wheying-off and free from post acidification during refrigerated storage.

• Low fat fermented milks are suitable for calorie conscious consumers.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
PROBIOTIC BACTERIAL CULTURE FOR PREPARATION OF FERMENTED MILK PRODUCTS FOR HEALTHY GUT

Rajeev Kapila and Suman Kapila

Animal Biochemistry Division

Email: rkapila69@rediffmail.com, Phone: 9416392519

- Probiotic culture belongs to the group of lactic acid bacteria and genus Lactobacillus.
- fermentum is the species of this indigenous human bacterial isolate based upon biochemical and molecular tests.
- It has bile tolerance, acid tolerance and good hydrophobicity for staying in gut.
- It has potential to improve immune homeostasis and anti-oxidative status during aging as determined on mouse model.
- It has tendency to resist growth of E.coli as determined through *in vivo* and *in vitro* trials.
- It improved intestinal epithelial integrity by attenuation of *E. coli* or LPS induced leaky epithelial barrier function.
- Safety assessment of this culture is underway by *in vivo* trials on mice.
- The culture has already been deposited in Microbial Type Culture Collection (MTCC), IMTECH, Chandigarh under Budapest treaty.

Sale price: Rs. 5.00 lakhs + GST (without royalty) for 10 years non-exclusive term.
Theme: Technologies for Nutrition of Dairy Animals

TOTAL MIXED RATIONS

S.S. Kundu

Dairy Cattle Nutrition Division

E-mail: sskundu.kln@gmail.com, Phone: 9416988744

The new technology of Total Mixed Ration (TMRs) feeding involves reducing the particle size of various feed ingredients including the roughage and concentrate portions and mixing them in proper quantities and proportions. The ingredients are blended sufficiently to prevent separation and sorting and selective eating of specific ingredients from the mixture by the animal. The combined feed is further enriched with necessary mineral and vitamin supplements and feed additives so that the final mixture is a complete balanced ration for the specific category of the dairy stock. The ingredients chosen are those which are locally available and within the easy reach of the dairy farmer and at his command or produced within his farm holding.

• The technology is labor saving.
• It is amenable to automatic, mechanized feeding.
• There is enhanced dry matter intake because of improvement in palatability.
• The technology enables inclusion of many novel and unconventional feed ingredients and crop residues of various kinds and agro-industrial byproducts.
• The feeding of TMR reduces wastage and economizes feeding cost.
• TMR feeding has been shown to sustain a fuller and higher plateau of lactation curve and higher production than conventional separate feeding.
• The technology enables formulating of rations specific to the nutrient needs of individual categories of dairy stock.
• The technology is compatible with computerized, modernized and intensive dairy production systems with high production goals.
• The technology which is already practiced in a traditional way in many farming households is refined and fine tuned to accommodate scientific principles and wide scale adaptability by all categories of farming community.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

MANUFACTURING PROCESS FOR FEED BLOCKS

S.S. Kundu
Dairy Cattle Nutrition Division
E-mail: sskundu.kln@gmail.com, Phone: 9416988744

Complete feed is a new concept in ruminant feeding which ensures the availability of all nutrients uniformly in balanced and adequate amount. It also avoids wastage of feeds during handling at the time of feeding, transportation and storage, besides saving the labor and transportation expenditure. This system also provides wide scope for the manipulation of diets, particularly those based on agro-industrial byproducts for making effective and economic feed formulations. The complete diet containing roughage and concentrate can be compressed using a hydraulic press after their mixing in a uniform blend. Use of some binder helps to obtain the diet in block form, in desirable weight, shape and size. Compression increases the bulk density by about three times which requires 1/3 cost of transportation and area for storage. The complete feed is more useful during the scarcity situation (flood, draught etc.) when feeds have to be transported for long distances. It is also advantageous for the dairy farms which are mushrooming at the peripheries of big towns, where space and labor are two major constraints.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.
AREA SPECIFIC MINERAL MIXTURE FOR DAIRY ANIMALS

Veena Mani

Dairy Cattle Nutrition Division

E-mail: veenamani1@yahoo.com, Phone: 0184-4035135

The mineral deficiency is manifested in the form of loss of hairs, skin disorders, anemia, loss of appetite, bone abnormalities and suboptimum production and reproductive problems. Thus, supplementation of minerals is inevitable to achieve optimum health and production. The technology is available for the formulation of mineral mixtures as per the recommendations of Bureau of Indian Standards for different species i.e. cattle, buffalo and goat to supplement major and trace minerals like Ca, P, Mg, Fe, Zn, Mn, I and Co etc. There are two types of formulations of mineral mixture, one is with salt and the other is without salt. It should be mixed in the concentrate mixture @ 2kg per 100 kg (without salt) and @ 3 kg/100 kg (with salt). Otherwise it can be supplemented @ 50 g per day per adult animal mixed in feed or in water. Supplementation increases the feed intake, feed conversion efficiency and productive performance of animals in terms of growth, reproduction and milk production.

Sale price: Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

DEGCURE MIXTURE FOR THE TREATMENT OF DEGNALA DISEASE

Chander Datt

Dairy Cattle Nutrition Division

E-mail: chandatt@gmail.com, Phone: 9996660010

Degnala disease is a chronic disease and can cause high mortality in buffaloes in certain areas of U.P., Punjab, Haryana and Pakistan. The Animals exhibit symptoms usually on tail, ear tips, forelimbs (distal to knee joint) and hind limb (below hock joints) and even sometimes on muffle and back. The skin and hooves are common tissues which are affected. First, symptoms appear on tail or ear tips leading to necrosis followed by gangrene or the legs may show swelling, skin necrosis and desquamation leading to open wounds. In some cases, later hooves may fall off and animals die. An
antidote mixture known as ‘Degcure’ has been evolved on the basis of reports in literature that selenium analogues were active for the enzymes of sulphur metabolism and thereby proteins were altered by substitution of selenomehtionine for methionine. This was the basis for sulphate treatment which was adopted to antagonise the effect of selenium toxicity at tissue level, preventing any mineral imbalance in the body of affected animals. It is a low cost treatment and Precious animals can be saved.

**Sale price:** Rs. 1.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

**ANIONIC MINERAL MIXTURE FOR REDUCING POST PARTUM PROBLEMS IN CATTLE AND BUFFALOES**

*Veena Mani*

*Dairy Cattle Nutrition Division*

E-mail: veenamani1@yahoo.com, Phone: 0184-4035135

Initiation of lactation places one of the greatest stresses on Ca homeostasis and is associated with milk fever among high producing dairy cows and buffaloes. Hypocalcemia also increases the incidence of dystocia, retained placenta, metritis, prolapsed uterus and delays uterine involution. Hypocalcaemia prevents the teat sphincter from closing both before and after milking and allows greater access to bacteria in the mammary gland which results in mastitis. During dry period, Ca requirement is 10-12 g/d hence mechanism for replenishing plasma Ca is relatively inactive. But upon partuition, Ca requirements are 10 times more than the supply in bloodstream which can not be met just by increasing the dietary level of Ca. Feeding of slightly negative-charged ration to pregnant cows/buffaloes at least 3 weeks before parturition creates metabolic acidosis and initiate Ca resorption from the bones thereby fulfilling the increased demands of Ca and blood Ca levels are maintained. Thus, supplementation of this special kind mineral mixture is effective for the prevention of hypocalcemia, minimizing the occurrence of milk fever and the many metabolic disorders that accompany this condition.

Apart from manipulation of cation anion balance, vitamin E is additionally added to the mineral mixture. It is well established that transition animals experience extensive
oxidative stress which is a contributing factor to increased susceptibility to a variety of disorders and poor reproductive performance. The supplementation of vitamin E can be useful against oxidative stress in periparturient dairy cows.

Therefore, the concept of this preventive approach to manage dairy cow nutrition and production diseases has great potential to assist farmers by providing increased profitability and reassurance regarding the health status of the farm livestock.

**Dosage:** 100 g/animal for 3-4 weeks before calving (it is stopped after calving).

**Mode of supplementation:** Mix with concentrate feeds, etc.

**Benefits:**
- Prevents milk fever, mastitis, metritis, retained placenta, dystokia and prolapsed uterus Improves immunity of the animals.
- Improves milk production upto 10 %
- Increases fat content of the milk.

**Sale price:** Rs. 2.50 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

---

**Other Technologies**

---

**BUFFALO MAMMARY EPITHELIAL CELL LINE (BUMEC_ND1)**

A.K. Mohanty, J.K. Kaushik, Sudarshan Kumar and A.K. Dang

Animal Biotechnology Centre

Email: ashokmohanty1@gmail.com, Phone: 0184-2259538

**Methodology:** Buffalo mammary tissue collected from the slaughter house was processed enzymatically to obtain a heterogenous population of cells containing both epithelial and fibroblasts cells. Epithelial cells were purified by selective trypsinization and were grown in a plastic substratum. The purified mammary epithelial cells (MECs) after several passages were characterized for mammary specific functions by immunocyto chemistry, RT-PCR and western blot.

**Principal Findings:** The established buffalo mammary epithelial cell line (BuMEC) exhibited epithelial cell characteristics by immunostaining positively with
cytokeratin 18 and negatively with vimentin. The BuMEC maintained the characteristics of its functional differentiation by expression of β-casein, κ-casein, butyrophilin and lactoferrin. BuMEC had normal growth properties and maintained diploid chromosome number (2n = 50) before and after cryopreservation. A spontaneously immortalized buffalo mammary epithelial cell line was established after 20 passages and was continuously sub cultured for more than 60 passages without senescence.

Conclusions: We have established a buffalo mammary epithelial cell line that can be used as a model system for studying mammary gland functions.

Sale price: USD 75000 + Taxes without royalty for 10 years non-exclusive terms.

A DEVICE FOR DIALYSIS OF SAMPLES IN MICROLITER VOLUME

Y.S. Rajput and Reena Sodhi
Animal Biochemistry Division

Email: ys_rajput@rediffmail.com, Phone: 9466653595

- A simple and efficient microdialysis assembly for dialysis of samples in microliter volumes(<200µl).
- The assembly is simple in construction and easy to use.
- The chances of formation of air-pockets between sample and dialysis membrane are very low and even if air pockets are formed, it is convenient to remove them without risk of rupturing membrane.
- Dialysis is highly efficient and removes 97% of small molecules in 2 hours.
- Recovery of large size molecules such as protein is in the range of 85 to 95%.
- Sample loading and recovery in assembly is convenient.
- Patent has been granted (Patent grant No: 195230, Grant Date: 24/11/2006, Date of patent: 18/03/2002).

Sale price: Rs. 3.00 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.
A MULTIPURPOSE DEVICE FOR DIALYSIS, CONCENTRATION AND BUFFER EXCHANGE OF SAMPLES IN MICROLITER VOLUME

Y.S. Rajput and M.P. Divya

Animal Biochemistry Division
Email: ys_rajput@rediffmail.com, Phone: +91-9466653595

- A multipurpose device for concentration, dialysis and buffer exchange of protein solution.
- The device is simple in construction, easy to use and is suitable for protein samples in microliter volumes (<200µl).
- The chances of blockade of pores of membrane by protein molecule are least and therefore free-flow of small molecules across semi-permeable membrane is maintained during use.
- Protein solution loading and recovery are convenient. Dialysis is highly efficient removing 85-90% of small molecules in 60 to 90 minutes.
- Up to 90% volume reduction of protein solution can be achieved in 60 minute with 86 to 90% protein recovery.
- Patent has been granted (Patent grant No: 276077, Grant Date: 29/09/2016, Date of filling: 25/07/2006)

Sale price: Rs. 4.50 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

NOVEL RNA ISOLATION METHOD FROM LIVER TISSUE OF RECALCITRANT ANIMAL SPECIES TO OBTAIN NGS (NEXT GENERATION SEQUENCING) QUALITY

Suneel Kumar Onteru, Dheer Singh, Davinder Sharma and Naresh Golla

Animal Biochemistry Division
Email: suneelvet@gmail.com; Phone: +91-8950735613

- RNA quality and quantity are the key components to affect the downstream molecular biology processes, including NGS.
• Particularly, the RNA with the RIN values greater than 6-7 can provide a reasonably comprehensive RNA profile of the tissues.

• Specifically, the secondary components in some tissues, like liver, can inhibit to obtain such a good quality RNA.

• Many commercially available RNA isolation kits could not handle this issue for purifying the high quality RNA without any secondary components.

• Hence, a novel method was developed to obtain better NGS quality RNA than the commercially available kits.

• The method includes majorly three reagents. This method works across different species, like chicken, mouse, sheep, goat and buffaloes (Figure 1).

• The advantages of this method are obtaining good NGS quality RNA from liver tissue across species in a short time (1 hr) and highly economical than commercially available RNA isolation kits.

Figure 1: RNA quality by agarose gel electrophoresis. The quality of RNA isolated by the novel method is depicted in the panel g. The RNA quality in the panels from a-f shows the isolated RNA by different commercially available RNA isolation kits. (a) Traditional SDS-phenol RNA isolation method (b) commercial RNA isolation Kit 1 (c) Commercial RNA isolation kit 2 (d) Commercial RNA isolation kit 3 (e) Commercial RNA isolation Kit 4 (f) Commercial RNA isolation kit 4 (f) Commercial RNA isolation kit 5 (g) The present novel method (h) NGS quality of total RNA isolated from buffalo liver by the novel method.

Sale price: Rs. 11.00 lakhs + GST (with 2% royalty) for 10 years non-exclusive term or Rs. 15.00 lakhs + GST (without royalty) for 10 years non-exclusive term.
NOVEL RNA ISOLATION METHOD FROM ADIPOSE TISSUE OF RECALCITRANT ANIMAL SPECIES TO OBTAIN NGS (NEXT GENERATION SEQUENCING) QUALITY

Suneel Kumar Onteru, Dheer Singh, Davinder Sharma and Naresh Golla

Animal Biochemistry Division
Email: suneelvet@gmail.com; Phone: +91-8950735613

• Generally, RNA isolation from adipose tissue is difficult due to the presence of lipid and low cell number.
• Particularly, obtaining NGS-quality RNA from recalcitrant adipose tissue is extremely difficult as the lipid obstructs the activity of commercially available reagents for RNA isolation.

Therefore, the currently available RNA isolation kits may work for one species successfully but not for another species, as the composition and amount of lipid varies in the adipose tissue of different species.
Therefore, we have developed a two-step protocol, including two buffers, for the extraction of very high NGS quality RNA from the adipose tissue of a broad range of animal species (Figure 1).

The advantages of this method are obtaining good NGS quality RNA from adipose tissue across species in a short time with less cost than the commercially available RNA isolation kits.

Sale price: Rs. 11.00 lakhs + GST (with 2% royalty) for 10 years non-exclusive term or
Rs. 15.00 lakhs + GST (without royalty) for 10 years non-exclusive term.

All the prices and terms & Conditions mentioned in this booklet are for Indian customers. Overseas customers may contact Agrinnovate India. The contact details of Agrinnovate India are as follows:

Agrinnovate India
G-2, A Block, NASC Complex,
DPS Marg, New Delhi- 110012, INDIA
Phone: +91-25842122
Fax: +91-25842124
Email: info@agrinnovate.co.in;
website: http://www.agrinnovateindia.co.in

The Price of Technologies listed in this Document may be subjected to change.
Glimpses of Technology Transfer Events

Transfer of technology of ‘DNA Based Method for Differentiation of Cow, Buffalo, Sheep, Goat and Camel Milk’ to IDMC Ltd. on June 05, 2017.


Transfer of technology of ‘Strip Based Test for Detection of Maltodextrin in Milk’ to Punjab Co-operative Milk Producers Federation Ltd. (Verka) on November 14, 2017.

Transfer of technology of ‘Preparation of Whey Mango Drink’ to Tamil Nadu Co-operative Milk Producers Federation Ltd. Aavin on February 15, 2018.

Transfer of technology of ‘Strip Based Test for detection of Neutralizers and Hydrogen Peroxide in Milk’ to DELMOS Research Private Ltd. Gurgaon on March 14, 2018.

For details please contact:

**Institute Technology Management Unit**
**ICAR-National Dairy Research Institute**
Karnal-132001, Haryana
Phone: +91-184-2259532 (O); +91-9416120181 (M)
Fax: +91-184-2250042 Email: itmundri@gmail.com

www.ndri.res.in