

# **TECHNOLOGIES**

**AVAILABLE AT NDRI**

**FOR COMMERCIALIZATION**

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**ICAR-NATIONAL DAIRY RESEARCH INSTITUTE**  
Karnal-132001, Haryana, India



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## PREFACE

ICAR-National Dairy Research Institute (NDRI) as country's premier research institution plays a key role in advancing the frontiers of Science and Technology in Dairy Sector. In the recent past, NDRI has developed a number of technologies; most of them have been commercialized to leading dairy industries of the country

The scientific team of NDRI is continuously making efforts to develop technologies as per the need of the dairy farmers and industry. Over the years, many scientists came forward with innovative technologies through their intensive research. Along with developing the technologies, NDRI has also made concerted effort in protecting the Intellectual Property through patents.

NDRI is making sincere efforts for transfer of the developed technologies to its end users. The technologies are being showcased at various events at Institute level as well as in other Institute-Industry Meets for the benefit of stakeholders. In this context, Institute Technology Management Unit (ITMU) at ICAR-NDRI has compiled the technologies developed at NDRI in the form of publication titled ***“Technologies Available at NDRI for Commercialization”*** and I appreciate the efforts of the scientists and their team in bringing out this publication.

It is hoped that this publication will facilitate in bridging the gaps in knowledge and establish an interface between the innovators and the industry and may then usher a new era of co-operation.



(R. R. B. Singh)  
Director



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## Theme: Innovative Dairy Products

### NUTRIMIX

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*Dairy Technology Division*

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- 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 ready-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 lakh + Taxes (18.0%) without royalty for 10 years  
non-exclusive terms.

## WHEY JALJEERA DRINK

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

*Dairy Technology Division*

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- 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 anti-oxidants.



**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 and Sanket Borad*

*Dairy Technology Division*

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- 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 and G.R. Patil*

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- 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 LASSI

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

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- 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 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## MILK PROTEIN-ENRICHED BAJRA SNACKS

*Ashish Kumar Singh*

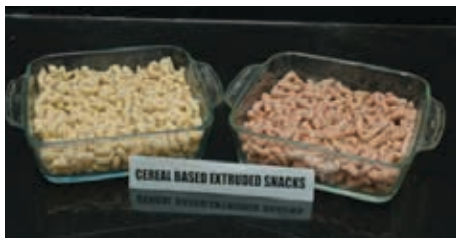
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- In recent past consumption of snack foods has increased significantly, however majority of snack foods are considered as calorie dense, salty and may contain compounds like monosodium glutamate (MSG).
- The formulation and processing technology of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

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- 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 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## **MILK PROTEIN-ENRICHED IRON FORTIFIED BAJRA BISCUIT**

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- 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 lakh + 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, Thompson, Devarja, H.C. and Sumit Arora*

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- 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 lakh + Taxes (18.0%) with 2% royalty or Rs.2.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## LOW-CALORIE AND FIBER FORTIFIED MISTI DAHI

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*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 DEVELOPED IN DIVISION OF DAIRY TECHNOLOGY

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- 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 lakhs + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

## TECHNOLOGY FOR THE MANUFACTURE OF ALOE VERA SUPPLEMENTED PROBIOTIC LASSI

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*Dairy Technology Division*

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- *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 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## READY-TO-RECONSTITUTE KHEER MIX

*A.A. Patel, G.R. Patil, R.R.B. Singh, Neeraja Tyagi,  
Vishal Tripathi and Alok Jha*

*Dairy Technology Division*

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

*Contact: email: abdulndri@gmail.com, Phone: 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 lakh + Taxes (18.0%) with 2% royalty or Rs.2.50 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## READY-TO-RECONSTITUTE RASMALAI MIX

*G.R. Patil, R.R.B. Singh, A.A. Patel, S.K. Nayak, Sangeeta Mishra*

*Dairy Technology Division*

*Email: grpdri@gmail.com, Phone: 9466149003*

*Contact: email: abdulndri@gmail.com, Phone: 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.



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

## 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](mailto:grpndri@gmail.com), Phone: 9466149003

Contact: email: [abdulndri@gmail.com](mailto: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. 1.00 lakh + Taxes (18.0%) with 2% royalty or  
Rs. 1.50 lakh + 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](mailto:grpndri@gmail.com), Phone: 9466149003

Contact: email: [abdulndri@gmail.com](mailto:abdulndri@gmail.com), Phone: 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



- 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 lakh + 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, Phone: 9466149003*

*Contact: email: abdulndri@gmail.com, Phone: 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 lakh + Taxes (18.0%) with 2% royalty or Rs. 2.50 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## LOW FAT OVEN BAKED GULABJAMUN

*G.R. Patil, R.R.B. Singh, A.K. Singh, A.A. Patel,  
Anuradha Singh and Rekha Dahiya*

*Dairy Technology Division*

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

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

*Contact: email: abdulndri@gmail.com, Phone: 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. 1.00 lakh + Taxes (18.0%) with 2% royalty or  
Rs. 1.50 lakh + 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 lakh + Taxes (18.0%) with 2% royalty or Rs. 2.00 lakh + 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  $\beta$ -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 lakh + Taxes (18.0%) with 2% royalty or Rs. 2.50 lakh + 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 through 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 through 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 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 OF LOW SODIUM PROCESSED MOZZARELLA CHEESE

*Yogesh Khetra, S.K. Kanawjia and G.S. Meema*

*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.5.0 lakh+ Taxes (18.0%) with 2% royalty or Rs.6.0 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## 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,  $1.55 \pm 0.05\%$ ; protein,  $4.73 \pm 0.25\%$ ; lactose,  $4.25 \pm 0.25\%$ ; sucrose,  $5.7 \pm 0.3\%$ ; mannitol  $3.1 \pm 0.17\%$ ; pH,  $4.43 \pm 0.02$ ; titratable acidity  $0.93 \pm 0.026\%$  and viscosity,  $0.395 \pm 0.004$  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 lakh + 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 lakh + 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



SOYBEAN

SOY MILK

SOY YOGHURT

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 lakh + 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



**soy dahi**

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

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

## BIOFUNCTIONAL FRUIT YOGHURT

*Shilpa Vij and Jagrani Minj*

*Dairy Microbiology Division*

*Email: shilpavijn@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 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## Theme: Technology of ensuring Quality and Safety of Dairy Products

### A NEW RAPID TEST FOR DETECTION OF DETERGENT IN MILK

*Rajan Sharma, Y.S. Rajput and Amit Kumar Barui*

*Division of Dairy Chemistry, Division of Animal Biochemistry*

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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.



*Figure: The blue colour in lower layer indicates milk sample adulterated with detergent whereas purple colour in lower indicate pure milk sample*

**Sale price:** Rs. 6.00 lakh + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

Rs. 7.50 lakh + 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*

*Division of Dairy Chemistry*

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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 rosolic acid test and the strip can detect presence of NaOH,  $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$  at concentration of 0.03, 0.06, 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 house hold.



**Sale Price:** Rs. 1.50 lakh + Taxes (18.0%) with 2% royalty for 10 years on non-exclusive terms.



## A NEW STRIP BASED TEST FOR DETECTION OF UREA IN MILK

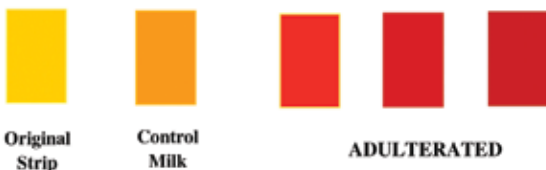
*Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput  
and Bimlesh Mann*

*Division of Dairy Chemistry*

*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 house hold.



**Sale Price:** Rs. 1.50 lakh + Taxes (18.0%) with 2% royalty for 10 years on non-exclusive terms.

## STRIP BASED TEST FOR DETECTION OF GLUCOSE IN MILK

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

*Division of Dairy Chemistry, Division of Animal Biochemistry*

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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



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

produced in the strip is proportional to the amount of glucose present in milk sample. The test can detect presence of 0.02% level of glucose in milk. The test can be used at milk reception centers and also at house hold.

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

## STRIP BASED TEST FOR DETECTION OF HYDROGEN PEROXIDE IN MILK

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

*Division of Dairy Chemistry, Division of Animal Biochemistry*

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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 0.005% level of hydrogen peroxide 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. 1.00 lakh + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms or

Rs.1.50 lakh + 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*

*Division of Dairy Chemistry, Division of Animal Biochemistry*

*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 0.05% level of maltodextrin in milk. The test can be used at milk reception centres and also at house hold.



*Figure: Change in colour of strip in presence of different levels of maltodextrin in milk*

**Sale price:** Rs. 1.50 lakh + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

Rs. 2.25 lakh + 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*

*Division of Dairy Chemistry, Division of Animal Biochemistry*

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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



*Figure: Working of the sucrose detection strip. The development of pink colour indicates presence of sucrose in milk*

original white colour. The test is convenient to do and can be easily done at milk collection center as well as at house hold 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 lakh + Taxes (18.0%) with 2% royalty for 10 years non-exclusive terms.

## TECHNOLOGY TO PREPARE A KIT FOR THE DETECTION OF VEGETABLE OIL/ FATS IN GHEE

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*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+ $\beta$ - 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.

## METHODOLOGY TO CONFIRM THE PRESENCE OF LARD IN GHEE

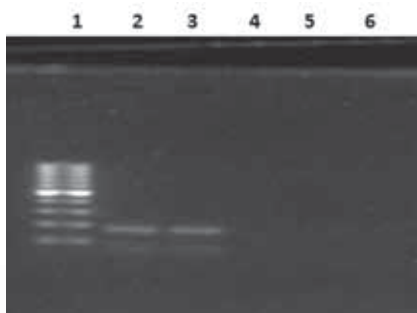
*Vivek Sharma, Tanmay Hazara, Sumit Arora, Rekha Sharma and Sachinandan De*

*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: 3.0 lakhs + Taxes (18.0%) without royalty for 10 years on non-exclusive basis.

## 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.

Microbiological Quality Assurance Lab. NRC,  
Dairy Microbiology Division

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Two-stage bio-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  $4.30 \pm 0.10$  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  $24 \pm 0.3$  h at  $1.2 \log$  cfu levels for 25g / or  $22 \pm 0.3$  h 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 lakh + Taxes (18.0%) with 2% royalty or Rs. 7.5 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

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

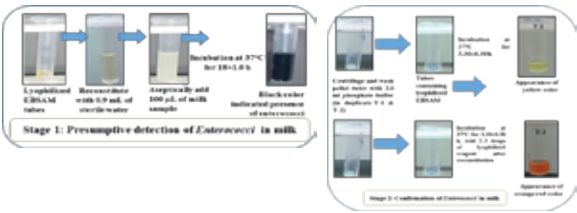
*Naresh Kumar, G. Kaur, G. Thakur, Raghu H. V., N. A. Singh,  
N. Raghav and V. K. Singh*

*Microbiological Quality Assurance Lab. NRC,  
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  $18 \pm 1.0$ h of incubation at  $37^{\circ}\text{C}$  in stage-1 employing EBSAM as selective medium in lyophilized form and its confirmation within  $3:30 \pm 0.30$ h 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 M/s SGS India Pvt. Ltd, Gurgaon, Certificate no. SGS GG12-009685.001 dated 09-11-2012
- Wide scope of application to raw, pasteurized and dried milks for routine as well as for regulatory standard compliance

**Sale price:** Rs. 3.0 lakh + Taxes (18.0%) with 2% royalty or Rs. 3.5 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

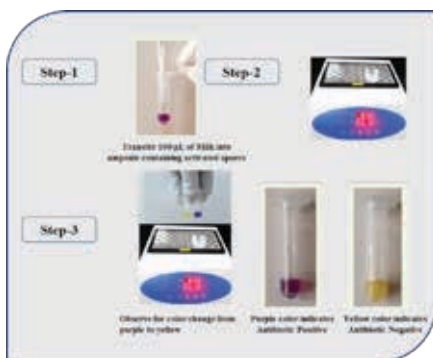
## SPORE BASED KIT FOR DETECTION OF ANTIBIOTIC RESIDUES IN MILK AT DAIRY FARM

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

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Dairy Microbiology Division*

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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  $\geq$  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  $\geq$  MRL level.

- The Cost effective (Rs 35 per test )
- Semi-quantitative detection of  $\beta$ -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. 3.0 lakh + Taxes (18.0%) with 2% royalty or Rs. 4.00 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

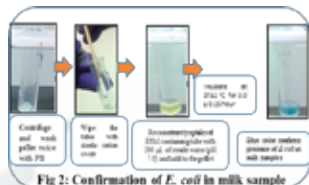
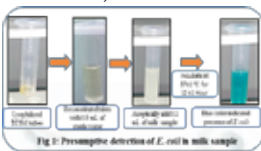
## RAPID TEST FOR DETECTION OF *E. COLI* IN MILK

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

*Microbiological Quality Assurance Lab. NRC,  
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  $12 \pm 1.0$ h 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  $3.00 \pm 0.15$ h 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  $12.0 \pm 1.0$ h for presumptive detection and  $3.0 \pm 0.15$ h 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 lakh + Taxes (18.0%) with 2% royalty or Rs. 7.5 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## RAPID TEST FOR DETECTION OF COLIFORMS IN MILK

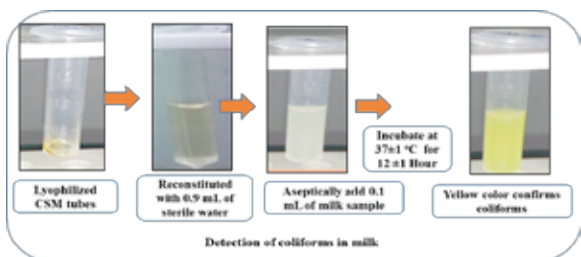
*Naresh Kumar , Ramakant L, Avinash, Bhawna A, Raghu H.V.,  
M. Balhara, S Kadyan and V. Kumar*

*Microbiological Quality Assurance Lab. NRC,  
Dairy Microbiology Division*

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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  $12.15 \pm 0.30$ h 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 / or

ISO 4831:2006 requiring 72h using MPN method (**Patent Reg. 2214/DEL/2014**).



- Appearance of yellow color confirms presence of coliforms as depicted in above fig.
- The developed enzyme assay for coliforms can confirm  $<1.0 \log \text{ cfu/ml}$  within  $12.15 \pm 0.30 \text{ h}$  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.2.0 lakh + Taxes (18.0%) with 2% royalty or Rs. 2.5 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## PAPER STRIP ASSAY FOR RAPID DETECTION OF PESTICIDE RESIDUES

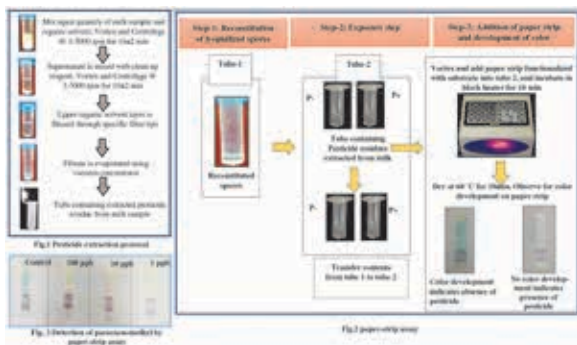
*Naresh Kumar, N. Tehri, R. Gopaul, P. K. Sharma,  
Morab S. and Raghu H. V.*

*Microbiological Quality Assurance Lab. NRC,  
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 acetylcholinesterase 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 1-10ppb 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 lakh + Taxes (18.0%) with 2% royalty or Rs. 7.5 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

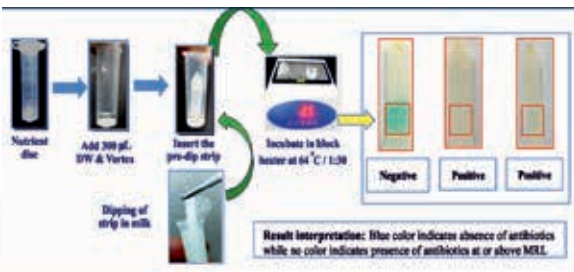
## PAPER STRIP BASED ASSAY FOR DETECTION OF ANTIBIOTIC RESIDUES IN MILK

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

*Microbiological Quality Assurance Laboratory, NRC, 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 applications. 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 include 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 1:30 hrs. 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  $\beta$ -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 1:30 hrs.
- 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 lakh + Taxes (18.0%) with 2% royalty or Rs. 7.5 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.



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

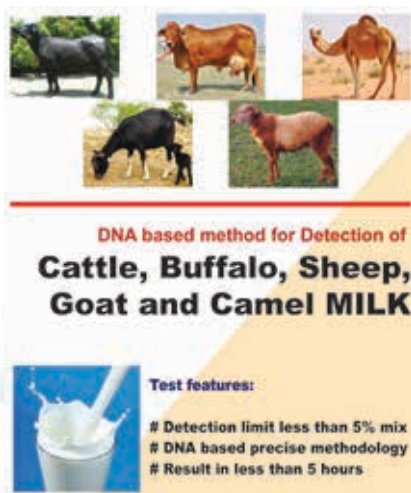
*Sachinandan De, Sushil Kumar and Devika Goutam*

*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 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 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: +91-9466653595*

- 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.
- Patent filed (No: 1864/DEL/2013).

**Sale Price:** Rs. 4.00 lakh + 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: +91-9466653595*

- 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 lakh + Taxes (18.0%) with 2% royalty extra on sale price for 10 years non-exclusive terms.

### Theme: Innovative Microbial Culture for Dairy Product Formulation



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

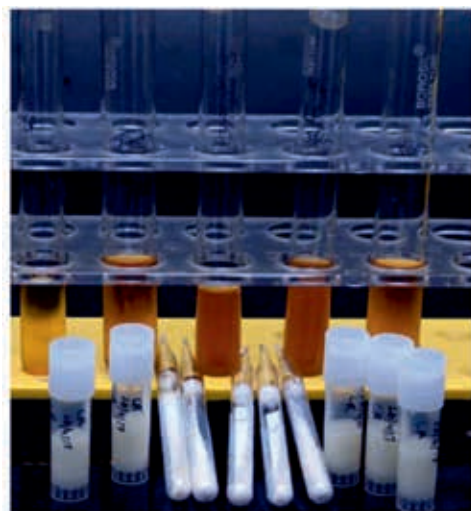
*Rajeev Kapila, Suman Kapila, Rohit Sharma, Vamshi Saliganti, Meena Kapasiya and Gulshan Dass*

*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 + Taxes (18.0%) without royalty on non-exclusive basis for 10 years; or USD 15000 + Taxes without royalty on non-exclusive basis for 10 years.

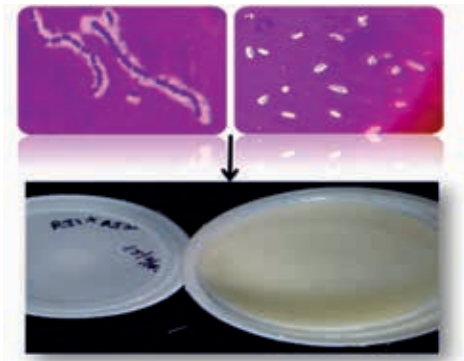
## TECHNOLOGY OF SOUR DAHI USING PROLIFIC ACIDIFYING LACTIC CULTURES

*Pradip V. Behare, S. K. Tomar, 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.

**Cost of Technology:** Rs. 1,50,000 + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## TECHNOLOGY FOR LOW FAT “SHRIKHAND” WITH EXOPOLYSACCHARIDES (EPS) PRODUCING LACTIC CULTURE

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

*Dairy Microbiology Division*

*Email: pradip\_behare@yahoo.com, Phone: 8295726103*

Shrikhand has a very high nutritive value, characteristic flavour and taste, palatable nature, possible therapeutic value and higher shelf-life. Due to this feature many dairy industries have shown keen interest to produce Shrikhand on large scale. Now a day consumers are more inclined towards low fat/fat free dairy foods and therefore development of Shrikhand with reduced amount of fat may attract both consumers and entrepreneurs. But production of such product may affect its textural and sensorial quality, which can be overcome by the use of exopolysaccharides producing lactic cultures. Exopolysaccharides of lactic acid bacteria can act as natural bio thickening agent which does not require extra additives to maintain ideal texture of the product.

- The invention is related to production of low-fat Shrikhand with improved quality and increased yield using EPS+ lactic culture(s).
- Standardized protocol for low-fat Shrikhand with improved body, mouth feel and sensory attributes.
- Intervention through use of two defined EPS producing Lactic Acid Bacteria strains

**Price of technology:** Rs. 3,00,000/- + 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 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

## **COST EFFECTIVE FOOD GRADE MEDIUM FOR LACTOBACILLUS SP.**

*Surajit Mandal*

*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 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.

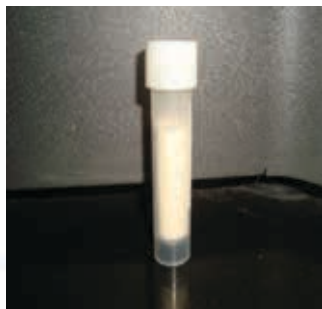
## DIRECT PRODUCT PROBIOTIC (DPP) FORMULATION OF *LACTOBACILLUS* CULTURE

*Surajit Mandal*

*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:  $11-12 \log \text{ cfu/g}$ ; stable till 75 days at  $-20^\circ\text{C}$ .
- Application study: in fermented and non-fermented dairy products (approx.  $10^8 \text{ cfu/ml}$  of final product) and stable under refrigerated conditions.
- Concentrate *Lactobacillus* culture can be used as DPP.



**Sale price:** Rs. 7.50 lakh + Taxes (18.0%) without royalty for 10 years non-exclusive terms.



## WHEY BASED MEDIUM FOR LACTIC ACID BACTERIA

*Surajit Mandal*

*Dairy Microbiology Division*

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- 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, Pradip V. Behare*

*Dairy Microbiology Division*

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- 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 LASSI

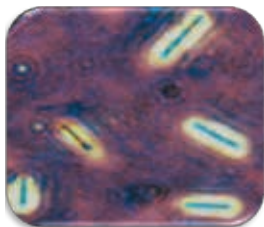
*Pradip V. Behare, S.K. Tomar and Surajit Mandal*

*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<sup>+</sup> (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, 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<sup>+</sup> 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.

## 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*

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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*

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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*

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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 selenomethionine 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*

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**Importance of technology :** 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 parturition, 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:** 100g/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 lakh + 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 b-casein, k-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*

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- 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 lakh + 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 filing: 25/07/2006)

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



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