ICAR-NATIONAL DAIRY RESEARCH INSTITUTE

1. ICAR-National Bureau of Animal Genetic Resources, Karnal
2. ICAR-Central Institute for Research on Buffaloes, Hisar
3. ICAR-Central Institute for Research on Cattle, Meerut
4. ICAR-Central Institute for Research on Goats, Mathura
5. ICAR-National Research Centre on Camel, Bikaner
6. ICAR-National Research Centre on Equines, Hisar
7. ICAR-National Research Centre on Mithun, Dimapur
8. ICAR-National Research Centre on Yak, Dirang
INSTITUTE – INDUSTRY MEET and TECHNOLOGIES FOR COMMERCIALIZATION

December 17, 2015

Organized by:
Zonal Agro-Technology Management Center
ICAR-NATIONAL DAIRY RESEARCH INSTITUTE
Karnal-132001, Haryana, India

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Co-organizing Secretary: Ashish Kumar Singh
INSTITUTE-INDUSTRY MEET
AND
TECHNOLOGIES FOR COMMERCIALIZATION
ICAR-NDRI, Karnal – December 17, 2015

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ICAR-National Dairy Research Institute (NDRI) has key role in advancing the frontiers of Science and Technology in dairy Sector. In the recent past, NDRI has developed number of technologies and a number of them has been transferred to leading dairy industries of the country. This has been possible through the efforts of the scientists and also through the platform of NDRI-Industry Meet. The organization of the NDRI-Industry Meet has been the regular feature at NDRI since last five years. NDRI has also made significant effort in protecting the IPR through patents.

Recently, ITMC at NDRI has been entrusted with the responsibility of the Zone and accordingly Zonal Agro-Technology Management Centre (ZTMC) has been established. The other member institutes of the zone are ICAR-National Bureau of Animal Genetic Resources, ICAR-Central Institute for Research on Buffaloes, ICAR-Central Institute for Research on Cattle, ICAR-Central Institute for Research on Goats, ICAR-National Research Centre on Camel, ICAR-National Research Centre on Equines, ICAR-National Research Centre on Mithun, ICAR-National Research Centre on Yak.

In this year, the Institute-Industry Meet is being organized on December 17, 2015 under the umbrella of ZTMC wherein all the above institutes will present their technologies to the prospective buyer. Technologies ready for commercialization will be demonstrated, negotiated for sale in Business to Business (B2B) environment during the meet.

The scientists at our zone are in constant touch with stakeholders. In this direction, feedback received from earlier NDRI-Industry Meets has helped the scientists of NDRI in further refining the technologies. At times, a number of technologies are available with R&D organization but these are not communicated to industries for their technology transfer. NDRI is making sincere efforts for converting innovations into technologies for its ultimate use by stakeholder.

ZTMC at NDRI has compiled the publication titled “Technologies for Commercialization” and I appreciate the efforts of scientists in bringing out this publication on the event of Institute-Industry Meet. Finally it is hoped that this Meet will facilitate a concerted effort to increase transparency between innovators and industry and shall encourage further cooperation between the two.

(A. K. Srivastava)
Director
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from
ICAR-NATIONAL DAIRY RESEARCH INSTITUTE
NUTRIMIX

Ashish Kumar Singh, P.N. Raju, Amol Sahare, D.N. Yadav 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 + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

WHEY JALJEERA DRINK

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

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

- Whey jaljeera drink is 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 + ST (14.50%) with 2% royalty and Rs. 1.00 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.
BAJRA LASSI

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 + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) 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-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 + ST (14.50%) with 2% royalty and Rs. 1.00 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

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

*Ashish Kumar Singh*

*Dairy Technology Division*

*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 + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.
TECHNOLOGY FOR PREPARATION OF IMPROVED TEXTURED DAHI

Latha Sabikhi, Sathish Kumar M.H. and Mohammad Sharique

Dairy Technology Division
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- Formulated dahi had improved body & texture
- The product has increased firmness
- The product showed reduced whey syneresis during storage
- The product was acceptable up to 25 days at 4°C storage
- Better textured product can be prepared with low milk solids
- A cost effective technology to make longer shelf life dahi with low milk solids
- Technology consists of an easily adaptable processing steps, hence adaptation doesn't require any additional resources for an existing dahi manufacturing unit.

Sale price: Rs. 1.00 lakh + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) 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: 9896037404

- 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% 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 + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) 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 lakh + ST (14.50%) with 2% royalty and Rs.2.00 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.
LOW-CALORIE AND FIBER FORTIFIED MISTI DAHI

P. Narender Raju and Dharam Pal
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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 + ST (14.50%) with 2% royalty and Rs. 1.00 lakh + ST (14.50%) without 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: adbdulndri@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 + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) 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: adbdulndri@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 + ST (14.50%) with 2% royalty and Rs.2.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

**READY-TO-RECONSTITUTE RASMALAI MIX**


**Dairy Technology Division**

Email: grpndri@gmail.com, Phone: 9466149003

Contact: email: adbdulndri@gmail.com, Phone: 9896668983

- Great consumer convenience and time saving.
Shelf stable for > 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 + ST (14.50%) with 2% royalty and Rs. 2.50 lakh + ST (14.50%) 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*

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- 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 + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) 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: grpnndri@gmail.com, Phone: 9466149003

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- 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 + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.
EXTENDED SHELF LIFE FUNCTIONAL PANEER

S.N. Rajkumar, R.R.B. Singh, G.R. Patila and A.A. Patel

Dairy Technology Division
Email: grpndri@gmail.com, Phone: 9466149003
Contact: email: adbduindri@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 + ST (14.50%) with 2% royalty and Rs. 2.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

LOW FAT OVEN BAKED GULABJAMUN


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Email: grpndri@gmail.com, Phone: 9466149003
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- 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 + ST (14.50%) with 2% royalty and Rs. 1.00 lakh + ST (14.50%) 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: adbdulndri@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 + ST (14.50%) with 2% royalty and Rs. 1.50 lakh + ST (14.50%) 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 biopreservatives to 42 days under refrigeration.

**Sale price:** Rs. 1.50 lakh + ST (14.50%) with 2% royalty and Rs. 2.00 lakh + ST (14.50%) 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 lakh + ST (14.50%) with 2% royalty and Rs. 2.50 lakh + ST (14.50%) 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 + ST (14.50%) 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 + ST (14.50%) without royalty for 10 years non-exclusive terms.

TECHNOLOGY OF BHAPA DAHI

Kaushik Khamrui
Dairy Technology Division, ICAR-NDRI, Karnal
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 + ST (14.50%) without royalty for 10 years non-exclusive terms.

TECHNOLOGY OF LOW SODIUM PROCESSED MOZZARELLA CHEESE

Yogesh Khetra and S.K. Kanawjia
Dairy Technology Division, ICAR-NDRI, Karnal
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 + ST (14.50%) 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 + ST (14.50%) with 2% royalty and Rs 6.0 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

### Strip based test for detection of neutralizers 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: 0184-2259163*

A rapid paper based strip test has been developed for the detection of neutralizers in milk. The prepared strip is yellow in colour. The test involves dipping of the strip in milk samples followed by immediate visualization of colour of the strip. The colour of the strip changes to deep red in milk containing neutralizers while in pure milk samples, the strip retained its original yellow colour. The test strip responds immediately when brought in contact with milk samples. The colour on the strip is stable for about 8-10 min. The developed test is more sensitive than the existing rosalic acid test and the strip can detect presence of NaOH, Na₂CO₃ and NaHCO₃.
at concentration of 0.04, 0.06 and 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 8 months at room temperature. The test can be used at milk reception centers and also at household.

![Original Strip, Control Milk, Adulterated Milk](image)

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

**Sale price:** Rs. 1.00 lakh + ST (14.50%) with 2% royalty for 10 years non-exclusive terms.

Rs.1.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

**STRIP BASED TEST FOR DETECTION OF UREA 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: 0184-2259163*

A rapid paper based strip test has been developed for the detection of added urea in milk. The prepared strip is yellow in colour. The test involves dipping of the strip in milk samples followed by visualization of colour of the strip after 3 min. The colour of the strip changes to red in urea adulterated milk samples while in pure milk samples, the strip colour either remains yellow or changes to light red (due to the presence of natural urea in milk). The intensity of red colour produced in the strip is proportional to the amount of urea present in 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 70 mg/100 ml of added urea in milk. The shelf-life of the strip is more than 4 and 6 months at room temperature and refrigerated temperature, respectively. The test can be used at milk reception centers and also at household.

![Original Strip, Control Milk, Adulterated Milk](image)

*Figure: The change in colour of strip in pure and adulterated milk sample*
Sale price: Rs. 1.00 lakh + ST (14.50%) with 2% royalty for 10 years non-exclusive terms or
Rs.1.50 lakh + ST (14.50%) 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*

*Division of Dairy Chemistry, Division of Animal Biochemistry*

_E-mail: rajansharma21@gmail.com, Phone: 0184-2259163_

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 0.02% 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](image)

Sale price: Rs. 1.00 lakh + ST (14.50%) with 2% royalty for 10 years non-exclusive terms or
Rs. 1.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.
STRIP BASED TEST FOR DETECTION OF HYDROGEN PEROXIDE IN MILK

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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 household.

![Image of strip test for detection of hydrogen peroxide in milk]

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

**Sale price:** Rs. 1.00 lakh + ST (14.50%) with 2% royalty for 10 years non-exclusive terms or
Rs.1.50 lakh + ST (14.50%) 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
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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 household.

![Strip Test Image]

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

**Sale price:** Rs. 1.50 lakh + ST (14.50%) with 2% royalty for 10 years non-exclusive terms.

Rs. 2.25 lakh + ST (14.50%) with 2% royalty for 10 years non-exclusive terms

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**A STRIP BASED TEST FOR DETECTION OF SUCROSE IN MILK**

*Priyae Brath Gautam, Rajan Sharma, 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 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.

*Figure. Working of the strip based test for detection of sucrose (at various levels) in milk.*

**Sale price:** Rs. 1.50 lakh + ST (14.50%) with 2% royalty for 10 years non-exclusive terms.
A NEW RAPID TEST FOR DETECTION OF DETERGENT IN MILK

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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 + ST (14.50%) with 2% royalty for 10 years non-exclusive terms
Rs. 7.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.
TWO STAGE ENZYME BASED ASSAY FOR DETECTION OF L. MONOCYTGENES IN MILK

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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* with in 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 lakh + ST (14.50 %) with 2% royalty and Rs. 7.5 lakh + ST (14.50 %) without royalty for 10 years non-exclusive terms.

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


*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±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 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 + ST (14.50 %) with 2% royalty and Rs. 3.5 lakh + ST (14.50 %) without royalty for 10 years non-exclusive terms.

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

*Kumar N, Khan A, Arora S, Raghu H V, Balhara M, Sharma PK and Shaikh S*

*Microbiological Quality Assurance Lab. NRC, 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 ≥ 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. 3.0 lakh + ST (14.50 %) with 2% royalty and Rs. 4.00 lakh + ST (14.50 %) without royalty for 10 years non-exclusive terms.
RAPID TEST FOR DETECTION OF *E. coli* IN MILK

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

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

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“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 lakh + ST (14.50 %) with 2% royalty and Rs. 7.5 lakh + ST (14.50 %) without royalty for 10 years non-exclusive terms.

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

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

*Microbiological Quality Assurance Lab. NRC, 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 / 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 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
Technologies available for Commercialization

- 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 + ST (14.50 %) with 2% royalty and Rs. 2.5 lakh + ST (14.50 %) without royalty for 10 years non-exclusive terms.

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**PAPER STRIP ASSAY FOR RAPID DETECTION OF PESTICIDE RESIDUES**


*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 has been developed based on the principle of “spore germination and enzyme inhibition”. 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).

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**Result interpretation**

*Fig.2 Development of blue color indicates absence of pesticide*

*Fig.3 No color development indicates presence of pesticide*
• Simple and cost-effective technology for field application especially at reception dock in dairy/food industries
• Rapid detection of pesticide residues especially organophosphorus and carbamate group at ≥ MRL
• Assay with high degree of sensitivity and reproducibility
• Internal lab validation with AOAC approved Charm 6602 assay
• No interference/cross-reactivity in the presence of other contaminants like aflatoxin M1, heavy metals, antibiotics, detergents, sanitizers and preservatives etc.
• Wide scope of application to conduct surveillance/risk assessment of pesticide in organized dairy farms and to screen raw, pasteurized, dried milk and other food products
• Long term stability under refrigeration conditions upto 8 months

Sale price: Rs.5.00 lakh + ST (14.5 %) with 2% royalty and Rs. 7.5 lakh + ST (14.5%) without royalty for 10 years non-exclusive terms.

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

*Falguni Patra, Sudhir Kumar Tomar and A.K. Singh*

*Dairy Microbiology Division, NDRI, Karnal.*

*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 dioxide produced during fermentation of milk.

![Image of milk products]

**Sale price:** Rs. 2.50 lakh + ST (14.50%) with 2% royalty for 10 years non-exclusive terms.

### STRAWBERRY WHEY DRINK

*Shilpa Vij and Samlesh*

*Dairy Microbiology Division*

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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 + ST (14.50%) without royalty for 10 years non-exclusive terms.

**HEALTH PROMOTING SOY YOGHURT**

*Deepika Yadav and Shilpa Vij*

*Dairy Microbiology Division*

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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.
LACTOSE FREE SOY DAHI

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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
  - 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 + ST (14.50%) without royalty for 10 years non-exclusive terms.
• 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 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

PROBIOTIC WHEY DRINK WITH ANTIDIARREAL ACTIVITY

Shilpa Vij and Vandna
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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

**CURCUMIN SOY WHEY DRINK**

*Shilpa Vij and Deepender*

*Dairy Microbiology Division*

*Email: shilpavijn@yahoo.co.in, Phone: 9996262683*

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 + ST (14.50%) 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 + ST (14.50%) 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 + ST (14.50%) 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 cfu/g; stable till 75 days at -20°C.
- Application study: in fermented and non-fermented dairy products (approx. 10⁷ cfu/ ml of final product) and stable under refrigerated conditions.
• Concentrate *Lactobacillus* culture can be used as DPP.

**Sale price**: Rs. 7.50 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

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

Pradip V. Behare, 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. 2.00 lakh + ST (14.50%) without royalty for 10 years non-exclusive terms.

TOTAL MIXED RATIONS

S.S. Kundu

Dairy Cattle Nutrition Division

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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 + ST (14.50%) 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.
Technologies available for Commercialization

(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 + ST (14.50%) 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 + ST (14.50%) 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 + ST (14.50%) without royalty for 10 years non-exclusive terms.
TECHNOLOGIES
from
OTHER ICAR INSTITUTE OF ZTMC
EQUIHERPES B-ELISA KIT

B.K. Singh, B.R. Gulati and Ntin Virmani

ICAR-National Research Centre on Equines, Sirsa Road, Hisar-125001, India

Email: rkg.nrce@mail.com, Phone: 01662-276748 (Ext.218); 9467160705

This kit has been developed for diagnosis of herpes virus-1 infection in horses. Infection due to this virus in horses causes abortion, stillbirths, and foal mortality, respiratory and neurological disease. EHV-1 is responsible for heavy economic losses to the equine industry worldwide by causing storm of abortions. EHV-1 infection led abortion has been reported in 15% (54/360) pregnant mares in an organized farm. In a national assessment of EHV-1 infection amongst equidae in India, 13.5% (349/2573) were found seropositive. Equiherpes B-ELISA Kit is an alternative to virus neutralization test. This kit is able to detect seroconversion i.e. ≥3 fold seroconversion in term of increase of percent inhibition of OD with single dilution (1:250) of paired serum samples. It will be useful for assessment of herd immunity in equine breeding farms where vaccination is undertaken against EHV-1. The diagnostic reagents of the kit were stabilized in liquid buffer so that the users can test the serum samples on different days as per the availability of test serum samples. The agreement between results obtained by VNT and Equiherpes B-ELISA Kit for detection of EHV-1 antibody in field sera (n= 1224) was 85.86% and 95% agreement between our laboratory results and other in-house/SAU’s/Govt laboratories. It will help in timely diagnosis of EHV-1 infection/ immunity with vaccination and control of the disease.

Sale price: Rs. 15.00 lakh + ST (14.5 %) with 10% royalty
A PREGNANCY DIAGNOSTIC KIT FOR EQUINE, BASED ON DETECTION OF ECG BY ELISA (PREGMARE KIT)

A.K. Gupta, Yash Pal and Sanjay Kumar

ICAR-National Research Centre on Equines, Sirsa Road, Hisar-125001, India

Email: rkg.nrce@mail.com, Phone: 01662-276748 (Ext.218); 9467160705

This is an early pregnancy kit based on ELISA which can be used for pregnancy diagnosis between 35 to 120 days of gestation in mares covered by horse stallions. It is based on the detection of PMSG or eCG which is released after conception (after about 30 days of gestation) from the endometrial cups in pregnant mares. This kit can be used both as qualitative and quantitative test. Only a few milliliter of serum is required for Pregnancy diagnosis by this kit. 72 single serum samples (36 in duplicate) can be tested with one kit. Ready to use ELISA plate is provided with eCG standards for quantification. This ELISA kit is rapid, sensitive, specific and animal friendly. Simple line graph is to be prepared along with minor mathematical calculation.

This kit costs quite low per test as compared to ultrasound scanning fee, ensure animal welfare during transport besides saving transporting fee and stress-related loss. Kit is stable for at least 6 months at 4°C. After constitution, reagents need to be used within 24 hr. Can be used both for early pregnancy and fetus viability. Economically, it is very beneficial to all categories of equine owners as cost per test is quite low as compared to ultrasound scanning fee. Secondly, they do not have to bear any extra cost for transportation of pregnant mare to veterinary clinics for pregnancy diagnosis.

Sale price: Rs. 10.00 lakh + ST (14.5 %) with 10% royalty
A HIGHLY SENSITIVE KIT FOR DETECTION OF ANTIBODIES AGAINST THEILERIA EQUI IN SERUM OF EQUIDS

Sanjay Kumar, Rajender Kumar, A.K.Gupta and S.C. Yadav

ICAR-National Research Centre on Equines, Sirsa Road, Hisar-125001, India
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Equine piroplasmosis is an acute, sub-acute or chronic tick-borne disease of equids, caused by an intra-erythrocytic protozoa Theileria equi (Babesia. equi) or Babesia caballi. A high sero-prevalence up to 35% of T. equi infection has been recorded among indigenous equid population. The disease condition caused by T. equi is more widespread and pathogenic than that by B. caballi. Recently, NRCE developed equine merozoite antigen-2 (EMA-2) recombinant protein antigen-based ELISA for detection of antibodies against T. equi parasite in equine serum.

The kit has ready-to-use ELISA plate onto which serum samples can be loaded after proper dilution. The kit has two steps – serum sample application and conjugate addition – which is quite convenient and time saving. The results can be obtained in 1hr 30 min times after application of serum samples. Serum samples shipped to laboratory at room/ambient temperature can be utilized for application in the kit. The kit has been validated vis-à-vis OIE recommended cELISA. The results on coded samples matched cent per cent. One ELISA plate can accommodate 42 test serum samples (in duplicate) along with reference positive and negative serum samples (in duplicate). Cut-off can be calculated by simple statistical application. Less time consuming and complicated than commercially available cELISA kit. All the reagents are stable at 4°C for upto 6 months.

Diagnostic Sensitivity = 94.0%,
Diagnostic Specificity =96.0%

Sale price: Rs. 8.00 lakh + ST (14.5 %) with 10% royalty
**EQUIP ROTAVIRUS TEST**

*B.R. Gulati and B.K. Singh*

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Rotavirus associated diarrhoea results in high morbidity and mortality in neonatal animals (including foals) and human infants. A monoclonal antibody-based sandwich enzyme immunoassay for diagnosis of rotavirus in different animals and human stool samples. EQUIP ROTAVIRUS TEST employs a polyclonal anti-rotavirus serum as coating antibody to capture the rotavirus antigen and a monoclonal antibody is used for detection of group-specific antigen present on the captured rotaviruses.

**Process:** Stool suspension or control sample is added in the ELISA modules coated with polyclonal antibody to capture rotavirus antigens. To the captured rotavirus in microwell, murine anti-rotavirus mAb is added, which is further detected by incubation with anti-murine horseradish peroxidase. A chromogen substrate is added in the wells to show the presence of bound conjugate. The color intensity in comparison with the negative controls indicate the presence of rotavirus in the samples.

The assay has 100% sensitivity and a specificity of 96% in comparison to virus isolation. There is good agreement between the results obtained by both virus isolation and ELISA (κ = 0.9346). The mAb-based ELISA developed in the present study is simple to perform, highly sensitive and specific assay for detection of rotavirus from equine stool samples. Will help in timely diagnosis of rotavirus associated diarrhoea in animal and human population, which, in turn, will help in developing control strategies.

**Sale price:** Rs. 15.00 lakh + ST (14.5 %) with 10% royalty

**EQUIHERPABORT VACCINE**

*B.K. Singh, Ntin Virmani and B.R.Gulati*

*ICAR-National Research Centre on Equines, Sirsa Road, Hisar-125001, India*

*Email: rkg.nrce@mail.com, Phone: 01662-276748 (Ext.218); 9467160705*

This vaccine has been developed for treatment of herpes virus-1 infection in horses. Infection due to this virus in horses causes abortion, stillbirths and foal mortality, respiratory and neurological disease. EHV-1 is responsible for heavy economic losses to the equine industry. The disease mostly spreads through aerosols, contaminated
food, water, bedding and other fomites. Healthy horses acquire infections mostly through respiratory tract. EHV-1 infection led abortion has been reported in 15% (54/360) pregnant mares in an organized farm. In a national assessment of EHV-1 infection amongst equidae in India, a total of 2573 serum samples were tested from 1989 to 1997. Of these, 13.5% (349/2573) were found seropositive.

The dose is 2 ml I/M and is inoculated at 5th, 7th and 9th month of gestation. The immunization response of the vaccine at experimental level was satisfactory. The vaccinated animals showed booster response. They also withstood virulent challenge on experimental level. Then the vaccine was used in field trial. No untoward effect was seen after vaccination. Serum collected from the vaccinated animals was tested for virus neutralizing (VN) titre at monthly intervals for six month period. The mares were negative for VN antibody titre on the day of inoculation. The reciprocal VN antibody titres against EHV-1 upon primary vaccination (30 day post vaccination) were in the range of 8-16. The booster antibody response ranged between16-64. The results were in accordance to antibody titres observed with “Pneumabort ‘K’ imported vaccine as per our studies.

**Sale price:** Rs. 15.00 lakh + ST (14.5 %) with 10% royalty
Equine influenza - commonly known as ‘Horse Flu’ - is a viral disease of horses caused by Equine Influenza virus (EIV) subtype H3N8 belonging to Clade 2 of Florida sublineage. The disease resulted in heavy morbidity and led to huge economic loss.

An inactivated aluminium hydroxide adjuvanted vaccine was developed by NRCE consequent to 1987 outbreak using Ludhiana/87 isolate which belonged to predivergent lineage of the EIV isolates. The viruses belonged to the clade 2 of Florida sublineage of American lineage. For updation of the inactivated equine influenza vaccine, EIV isolates from various regions of the country viz. Katra (Jammu), Mysore (Karnataka), Ahmedabad (Gujarat), Gopeshwar (Uttarakhand) were cloned and their sequence was analysed for the HA gene for selecting the virus. All the virus isolates belonged to the clade 2 of Florida sublineage of American lineage and on the basis of sequence analysis A/eq/Katra (Jammu)/06/08 (H3N8) virus was selected for updating the vaccine. The vaccine was prepared and tested as per the standard procedures laid down by OIE, European Pharmacopoeia and European Medicines Agency (EMEA). The vaccine was made from the seed stock of EIV grown in bulk in 9-11 days old embryonated chicken eggs and the allantoic fluid was harvested, purified by ultracentrifugation and inactivated by Formalin.

Vaccination Schedule includes (i) First vaccination in animals above 6 months of age, (ii) followed by Booster Vaccine 4-5 weeks of first vaccine, and then (iii) Repeat Annually or after monitoring of titres (when HI titres are below 64 the animals need to be vaccinated again). The inactivated virus was checked for the sterility and inactivation prior to production of the vaccine. The vaccine was tested for the safety and potency in the equines and found protective against the disease. Field trials in 150 horses resulted in development of protective antibody titres, without any adverse reactions or clinical signs, following booster vaccination after four weeks. It will be very useful for vaccinating the animals which are under continuous movement inside and outside the country. Further, this updated EI vaccine empowers the country in terms of steering out of any exigent situation due to EI.
The vaccine can be used for ring/ mass vaccination with due recommendation from GOI, at the face of outbreak.

**Sale price:** Rs. 15.00 lakh + ST (14.5 %) with 10% royalty

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**AREA SPECIFIC MINERAL MIXTURE (ASMM) FOR IMPROVED PRODUCTION AND REPRODUCTION**

*D. Lal and N Saxena*

*ICAR- Central Institute for Research on Buffaloes, Hisar (Haryana)*

*Email: vbdixit@gmail.com, Phone: 01662-276431*

- The feeds were found deficient mainly in zinc (70%), manganese and copper (40%).
- The contents of calcium and phosphorus were also deficient (30-40%) in areas where supply of green fodder was limited.
- However, the micronutrients required by an adult animal per day is 46 & 42 grams of Ca and P and 997, 498 & 125 micrograms of Zn, Mg & copper, respectively
- Area specific mineral mixture can bring estrus within supplementation for about four to six weeks in 65% of anoestrus animals.
- Supplementation rate for ASMM to various categories of buffaloes:
  - Young calves up to 18 months of age @ 20-30 g/calf/day
  - Heifers @ 40-50 g/heifer/day
  - Milch buffaloes (< 10 kg/day) @ 50-60 g/buffalo/day
  - Milch buffaloes (>10 kg/day) @ 70-80 g/buffalo/day

It is equally important to mix equal quantity of common salt (animal feed grade) along with ASMM in the animal ration.

**Sale Price:** Cost worked out on the basis of used ingredients is about 50-60 Rs/kg including recurring manpower, machinery and packaging costs (Present cost Rs. 95 per kg.). The cost excludes expenditures made for marketing and fixed cost of space and machinery for mixing, grinding and packaging. Good mineral mixtures conforming to BIS type I
standards are available at more than Rs. 120 per kg. The ASMM proved to have better results with reduced cost of production as compared to other commercially available mineral mixtures.

**Royalty:** (with or without royalty. If with royalty, suggest % for sale price to be charged). As per Johal Committee recommendations for commercialization of technologies.

**OVSYNCH PLUS PROTOCOL FOR INDUCTION OF ESTRUS AND TIMED INSEMINATION IN BUFFALOES**

**R K Sharma**

*Animal Reproduction Division*  
ICAR- Central Institute for Research on Buffaloes, Hisar (Haryana)  
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- The protocol consists of administering follicle stimulating hormone (PMSG, 500 IU) on day 0, followed by GnRH (10 µg) on day 3, luteolytic dose of prostaglandin F2α (25 mg) on day 10, and second injection of GnRH on day 12, followed by fixed time insemination at 6 and 30 h after 2nd GnRH injection.
- This protocol induces estrus in cyclic as well as acyclic buffaloes within a close window and more successfully than Ovsynch alone.
- Animals not responding within the defined period, also resume cyclicity and become pregnant within one month of the treatment. Therefore, anestrus as well as silent estrus buffaloes can be subjected to this protocol for inducing tightly synchronized estrus, when timed inseminations can be done.
- Avoids the need for estrus detection.
- Long inter-calving periods can be shortened.

**Sale Price:** Rs. 700/- approx.
PELLETED COMPLETE FEED TECHNOLOGIES FOR SUSTAINABLE GOAT PRODUCTION UNDER INTENSIVE FEEDING SYSTEM

U. B. Chaudhary

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Declining feed and fodder resources and grazing area is a major challenge to goat rearing. To address this challenge, CIRG has developed complete feed technologies to cater to the nutritional requirement of goats under intensive feeding system. The technologies include tree leaves based complete feed pellets and monsoon herbage based complete feed pellets. Different combinations of dry leaves have been used with concentrate mixture in specified ratio. The herbage based complete feed consists of plant foliage with concentrate in appropriate ratio. The nutritive value (digestible crude protein) of the complete feed pellets is between 5.42 and 13.63 on dry matter basis. The cost of complete feed is Rs. 7-8 per kg with an average weight gain of 58 to 80 g/day in growing kids. The technologies have been adopted by several small and marginal goat farmers for sustainable goat production with considerable financial benefit. The technology has immense value to reduce pressure over available feed resources. It is readily available with CIRG.

Sale Price & Royalty: Negotiable

STRESSOL – G: AN HERBAL ANTISTRESS FORMULATION

Ashok Kumar, U. B. Chaudhary and P. K. Rout

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This polyherbal formulation was developed by a three plant extracts in suitable vehicle. The antioxidant efficacy of extract was tested under In-vitro by estimating free radicle scavenging, Lipid peroxidation etc. The clinical efficacy of this
formulation was evaluated in heat stress, cold stress animals by monitoring stress markers in goats such as SOP, MDA, heat & cold and HSP 70 catalase. The formulation was found effective in ameliorating the stress and positive effect on growth and production.

**Sale Price & Royalty:** Negotiable

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**INTRAVAGINAL PESSARIES FOR OESTRUS SYNCHRONIZATION IN GOATS**

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CIRG Intravaginal pessary relate to oestrus induction in an oestrus goats, shortening the post-partum interval, oestrus synchronization, more frequent kidding, increase in litter size in less prolific breeds, extending mating outside the normal breeding seasons. The reproductive potential of Indian goat breeds is relatively less as compared to the exotic breeds of goat. The variation may be genetic, environmental and managemental. Indian goat breeds are characterized by long post-partum interval resulting in greater inter kidding interval and less prolificacy in some Indian breeds of goat.

**Sale Price & Royalty:** Negotiable

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**PREPARATION OF GOAT MEAT PICKLE**

*V Rajkumar, Arun Kumar Verma and Arun Kumar Das*

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Goat meat pickle is a shelf-stable value added product prepared using precooked spent meat, common salt, dry and green spices, mustard oil, acetic acid, citric acid, cane sugar and packed in pet bottles. Addition of sugar and citric acid increased the
flavour and acceptability of the product. Technology, which is based on traditional
taste and method, is expected to be readily acceptable by even small-scale meat
processors/entrepreneurs. Product is highly acceptable among the meat eaters. It
has good market potential in towns, cities and for defence forces in remote and
difficult areas where fresh goat meat availability round the year is limited.

At ambient temperature it was acceptable for 3 months. The pH was 4.77. The SPC
and halophiles counts were log < 4.00 and yeast and mould counts were below log
1.00 CFU/g. The yield on slaughter weight, carcass weight and separated meat basis
were 23.34, 58.93 and 102.83 % respectively. To popularize it, single serve packets
needs to be made available in the market.

- Nutritional information:
  - Protein -12%; Fat -18%;
- Shelf life Room temperature - 60 days
- Product Yield - 92%

Sale Price & Royalty: Negotiable

PREPARATION OF GOAT MEAT NUGGETS

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Nuggets are comminuted processed meat product consisting of minced meat,
seasoned with spices and condiments, blended with vegetable oil, containing TSPP
and nitrite. The batter is filled into molds, cooked under pressure, cut in to 4 cm
cubes and heat-sealed in PE bags for storage and sale.

- Nutritional information:
  - Protein -15%; Fat -12%;
  - Saturated fat -7%; MUFA -3%; PUFA -2%; Omega 3 FA - 0.12%; Cholesterol (mg/g) -1.34
  - Shelf life
    Refrigeration -20days; Frozen -120 days

Goat Meat Nuggets
• Product Yield -92%
Protein and fibre rich meat product Highly acceptable

**Sale Price & Royalty**: Negotiable

**PREPARATION OF GOAT MEAT SAUSAGE**

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Sausages are getting popularity in Indian market especially as a fast food in big cities. This is a comminuted processed meat product consisting of minced meat, seasoned with spices and condiments, blended with vegetable oil, containing TSPP and nitrite and enclosed in goat casings and cooked (internal temperature 70-720°C)

- Nutritional information
  - Protein -14%; Fat -12%; Saturated fat -6%; MUFA -4%; PUFA -2%; Omega 3 FA -0.09%; Cholesterol (mg/g) -1.42

- Shelf life
  Refrigeration -20days; Frozen -120 days

**Sale Price & Royalty**: Negotiable
PREPARATION OF GOAT MEAT PATTIES

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Patties are one of the most liked ready to eat comminuted meat product, enjoying the highest degree of preference among the consumers owing to ease of preparation. This is lightly spiced product prepared using batter comprising of minced spent goat meat, refined vegetable oil, refined wheat flour, spices, condiments, and phosphates (0.3 %), molded to round shape and oven cooked (1800C for 25 min to an internal temperature of 78-800C)

- Nutritional information
  - Protein -14%; Fat -10%; Saturated fat -5%; MUFA -3%; PUFA -2%; Omega 3 FA -0.18%; Cholesterol (mg/g) -1.42
- Shelf life
  Refrigeration -20 days; Frozen -120 days

Sale Price& Royalty: Negotiable

MEAT SHAMI KEBAB

V Rajkumar, Arun Kumar Verma and Arun Kumar Das
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Kebabs are popular traditional meat products and have good scope as a fast food in India and other countries. The technology of Kebab preparation is traditional. Further studies on the effect of different types of fat on quality of Kebabs revealed that goat meat Kebabs with good quality and acceptability could be prepared by combining chicken (7.5%) and goat fat (7.5 %) in the raw formulations.
It had 25.0% protein and 14.0% fat. Shami Kebabs were prepared using spent goat meat (7 years old female) and the yield was 77.81 percent.

The product pH, T.A, percent moisture, fat, protein and ash contents were 6.44, 0.44, 55.99, 12.98, 27.98 and 2.60. The SPC, psychrotrophs, yeast and mold counts of cooked product were log 4.83, 2.70, <1.00 CFU/g sample. The Standard plate counts in Kebabs were log 4.36, psychrotrophs log 3.66, and yeast and mould counts log 1.81 CFU/g and well within permissible limits.

- Nutritional information: Protein -25%; Fat -14%; Saturated fat -7%; MUFA -5%; PUFA -2%; Omega 3 FA -0.09%; Cholesterol (mg/g) -2.72

Shelf life Refrigeration -14 days; Frozen -90 days

**Sale Price & Royalty**: Negotiable

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**HERBAL GOAT MEAT NUGGETS**

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The present invention is related to processed meat food products, which are prepared by the use of herbal plant materials and extracts in the processing of meat to prepare emulsion based functional meat products. The invention generally relates to add value to the goat meat and more particularly to use this for the preparation of comminuted goat meat products with the use of herbal plant materials and extracts for the fast food restaurants. Preparation of emulsion based goat meat products with the use of herbal plant materials and extracts will have human health benefits and also maintain the status of emulsion based functional meat products. The resultant product will have immune-modulating effect.

- Nutritional information:
  - Protein -15%; Fat -12%; Saturated fat -7%; MUFA -3%; PUFA -2%; Omega 3 FA -0.13%; Cholesterol (mg/g) -1.32

- Shelf life
  - Refrigeration -20 days; Frozen -120 days

- Product Yield - 92%

Protein, polyphenols and fibre rich meat product; Highly acceptable

**Sale Price & Royalty**: Negotiable
MEAT NIMKEE

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Market is dumped with carbohydraterich junk food, which is not suitable for the today's living style. The present invention addresses the above issues and it suits the present day requirement. The invention is related to meat food products. More particularly, the present invention relates to the processing of meat to produce snack meat food product. The invention generally relates to add value to the goat meat and more particularly for the fast food restaurants. Goat meat Nimkee will have more animal protein and also maintain the status of snack food. It has a shelf life of four months. The product is packed in modified atmospheric packaging method and can be kept under room temperature.

- Nutritional information
  - Protein -14%; Carbohydrate -44%; Dietary fibre -6%; Fat - 23 %; Saturated fat - 8.13% MUFA- 2.34%; PUFA - 22.43%; Omega 3 FA - 4.39%

- Shelf life
  - Room temp -4 month

- Product Yield -88%

- Crispier snack meat food product;
  - Highly acceptable

Sale Price & Royalty: Negotiable

MEAT MURUKKU

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The product is an eye-opener for the small scale industrialists who are dealing with meat products. Invention is related to meat food processing and particularly relates to the preparation of crispy meat based food product. The product will be an alternative to the junk foods available in the market which are only the source of carbohydrate and fats. The invention generally relates to add value to the meat and more particularly to use this for the preparation of Goat meat Murukku: a crispy
food product. The will have more animal protein than the traditional carbohydrate one and also maintain the status of crispy food. There is an intervention in the traditional popular product with the touch of science.

- Nutritional information
  - Protein -16%; Carbohydrate -53%; Dietary fibre -8%; Fat -21%; Saturated fat -3.88%; MUFA - 4.57%; PUFA - 23.76%; Omega 3 FA - 4.82%

- Shelf life
  Room temp -4 month

- Product Yield -88%

- Crispier snack meat food product; Highly acceptable

Sale Price & Royalty: Negotiable

MEAT/ MILK BISCUITS

V Rajkumar, Arun Kumar Verma and Arun Kumar Das
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Biscuits are popular food product but product with animal protein especially meat protein is not available. Moreover, this product has the dietary fibre and herbal mixtures with human health benefits. It is a functional meat product with growth promoting and immune-modulating effect. The present invention related to processed meat products, which are produced by the use of ayurvedic or herbal plant materials and extracts in the processing of meat to produce herbal meat biscuits. The invention generally relates to the preparation of herbal meat products such as biscuits particularly to add value and health benefits to the meat product and more particularly to add value to goat meat.

Nutritional information
- Protein -14%; Carbohydrate -55%; Fat -21%; Saturated fat - 5.62%; MUFA - 11.38%; PUFA - 5.81%; Omega 3 FA - 0.21%

Shelf life at Room temp -6 month

Product Yield -80%

Snack food with animal protein and herbs

Highly acceptable

Sale Price & Royalty: Negotiable
Present cereal market is with carbohydrate rich junk food, which is not suitable for the today’s living style. The present invention addresses the above issues and it suits the present day requirement. The invention is related to milk snack food products. More particularly, the present invention relates to the processing of meat to produce snack milk food product. The invention generally relates to add value to the goat milk. CIRG Cereal pops will have more milk protein and also maintain the status of snack food. It has a shelf life of four months. The product is packed in modified atmospheric packaging method and can be kept under room temperature.

- **Nutritional information**
  - Protein - 8.65%; 
  - Carbohydrate - 55%; 
  - Dietary fibre - 3%; 
  - Fat - 30%; 
  - Saturated fat - 23.29%; 
  - MUFA - 4.12%; 
  - PUFA - 8.77%; 
  - Omega 3 FA - 3.77%; 
  - Omega 6 FA - 4.99%

- **Shelf life** Room temp - 4 month
- **Product Yield** - 83%

Crispy snack food with goat milk protein; Highly acceptable

**Sale Price & Royalty:** Negotiable
BRUCHECK: A DOT-ELISA KIT FOR DETECTION OF BRUCELLOSIS IN GOATS AND SHEEP

V. K. Gupta

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The brucellosis in goats and sheep exclusively caused by *Brucella melitensis* and there is no diagnostic kit available in India which can exclusively detect brucellosis in goats and sheep. This dot-ELISA kit detects antibodies to *Brucella melitensis*. Sample antibodies bind to *Brucella melitensis* omp antigen attached to the nitrocellulose membrane of the spikes of the 12 spiked plastic comb. Binding of these antibodies is detected by reaction with horseradish peroxidase (HRP)-labeled affinity-purified antibodies to goat and sheep immunoglobulins. Attached HRP-labeled antibodies are detected by addition of enzyme substrate and visualized by subsequent blue color product development. Strong color development indicates the presence of antibody to omps 4g of *Brucella melitensis* in the sample. Very weak or no color development indicates the absence of antibody to *Brucella melitensis* in the sample. This test can be used to detect antibodies in serum.

**Sale Price & Royalty:** Negotiable

DEVELOPMENT OF A RAPID, USER FRIENDLY SINGLE TUBE TETRA PRIMER PCR BASED DIAGNOSTIC ASSAY FOR DETECTION OF BOVINE LEUKOCYTE ADHESION DEFICIENCY (BLAD) CARRIERS IN CATTLE

Rafeeqe Rahman Alyethodi, Umesh Singh, Sushil Kumar, Rajib Deb, Rani Alex, Sheetal Sharma and B. Prakash

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Bovine Leukocyte Adhesion Deficiency (BLAD) is a lethal autosomal recessive genetic disorder characterized by greatly reduced expression of the heterodimeric β2 integrin adhesion molecules on leukocytes resulting in multiple defects in leukocyte function. From a dairy cattle breeding and industry perspective, due to the widespread practice of Artificial Insemination, carrier animals get high chance of spreading this genetic defect to new generations while recessive homozygous animals do not survive for the adulthood. To identify BLAD positive animals
different techniques are used such as allele specific PCR, PCR-RFLP and real time PCR. But the tests/assays presently in use for the detection of BLAD have several disadvantages like they are time consuming and expensive. Therefore, a rapid and economical test for as routine screening of animals for BLAD is always in demand. The tetra primer based single tube PCR based assay developed for the detection of BLAD overcomes the potential limitations. The assay designed can be easily adapted in the laboratory for quick screening of BLAD among cattle. The technology developed is an improvement of the existing restriction digestion based detection of BLAD carriers. This technology utilizes four specifically designed primers instead of two in normal condition in conjunction with an optimized reaction condition. It enables to detect carrier with no need to use restriction digestion for identification of BLAD carrier animals.

The test having following usefulness:

- Rapidity – as the test can be completed in 2 to 2 and half hours (PCR and Agarose Gel electrophoresis analysis only).
- User friendliness – as it is easy to perform
- Economical – because it does not need expensive reagents (such as real time PCR machine, restriction enzyme, reagents for PAGE, Staining solution etc.)
- Specificity - as the assay employs tetra primer pairs with deliberately incorporated mutation.

1. Photographs: On request
2. Suggested Price of Technology: 15000/-
3. Royalty: No royalty

**A VISIBLE TEST FOR DIFFERENTIATING COW AND GOAT MILK/MEAT**

*Rajib Deb, Rani Alex, Sushil Kumar, Umesh Singh, T.V. Raja, Rafeeque Rahman Alyethodi, Gyanendra Sengar and B. Prakash*

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Species identification in dairy products has a remarkable importance in food adulteration traceability and fraud control. The goat milk chain plays an important role in the social aspect as the family-based system employs a large number of individuals and often is the primary source of income for the goat keepers. A
number of recent scientific studies have examined differences between cow and goat milk. Differences in their fat, protein and sugar compositions have been observed and these differences may explain why it is considered that goat milk is easier to digest and less likely to cause intolerant type symptoms. The fat globules in goat milk are smaller in size than in cow milk which makes goat milk easier to digest especially by infants and sick peoples. The unique composition of the type of fats found in goat milk have been studied, and certain trans fats, the consumption of which are known to be a risk factor for heart diseases are found in significantly lower proportions in goat compared to cow milk. It is also established that cow milk causes allergic reactions which is significantly lower in goat milk. Goat milk contains a similar amount of lactoglobulin as cow milk but less of particular casein known as alpha s1-casein. Thus the adulteration of cow milk within goat milk needs to be ruled out. In some parts of our country, goat milk is not preferred for regular household use due to “goaty” odor and thus is sold out. People try to blend the cow milk for suppressing the flavor of goat milk. Being superior in tenderness and having low cholesterol content, goat meat (Chevon) is preferred by the consumers in our country. In India, cattle slaughter is banned in larger parts of the country and hence goat meat is mostly preferable for domestic consumption. Despite ban on cow slaughter, illegal slaughter does take place and the beef is mixed with other meats including Chevon. Thus, illegal admixing of cattle meat with goat meat need to be ruled out. With the advancement of new biotechnologies, ready to eat processed foods are available in the market and it is a daunting task for the consumers to identify the species of origin of the products. Consequently, to safeguard consumer’s right, a technology for detecting mixing of goat meat as well as milk with that of cattle is the need of the hour. Some efforts have been made to differentiate cattle and goat milk and meat samples using various molecular tools. Among these methods, duplex PCR, RAPD, multiplex fluorescent real-time PCR, ELISA etc have been reported for differentiating goat and cow milk or meat DNA. But the reported tests/assays have certain disadvantages like time, lengthy protocol requirements; require costly equipment and reagents etc. In the present study a simple test has been developed which can be easily adapted in laboratory for quick detection of cow milk/meat DNA in goat samples using a DNA color based differentiation. The DNA color based assay developed can be used for the rapid detection of cow/goat milk/meat DNA in goat/cow samples and can be easily adapted in laboratories. The test can detect 2-3% of adulterated cow/goat milk and up to 1 mg of cow meat in goat samples. The test having the following usefulness:

1. **Rapidity** – as the test doesn’t require PCR downstream processing, it can save time
2. User friendliness – as it is easy to perform
3. Economical – because it does not need certain costly instruments (such as Electrophoresis apparatus, Gel Documentation System)
   1. Photographs: Photographs will be provided on request
   2. Suggested Price of Technology: Rs 25,000/ approx.
   3. Royalty: Without Royalty

**CAMEL MILK KULFI (KARABH KULFI)**

*Raghvendar Singh, Gorakh Mal and Devendra Kumar*

*ICAR-National Research Centre on Camel, Bikaner*

*Email: drshirish009@gmail.com, Phone: 0151-2230183; 9414052404*

Details of Technology:

- Dry fruit added Concentrated Milk,
- Sweetened,
- Flavoured,
- Low fat with high quality, rich in micro-minerals & Protective Protein

**Sale Price:** One time non-exclusive license fee per client (Negotiable)

**Royalty:** Negotiable

**CAMEL FLAVOURED MILK**

*Raghvendar Singh, Gorakh Mal and Devendra Kumar*

*ICAR-National Research Centre on Camel, Bikaner*

*Email: drshirish009@gmail.com, Phone: 0151-2230183; 9414052404*

- Pineapple flavoured processed milk with stabilizer,
- Sweet in Taste

**Sale Price:** One time non-exclusive license fee per client (Negotiable)

**Royalty:** Negotiable
LYOPHOLIZED CAMEL MILK POWDER

Raghvendar Singh and Gorakh Mal

ICAR-National Research Centre on Camel, Bikaner

Email: drshirish009@gmail.com, Phone: 0151-2230183; 9414052404

- Processed milk,
- Freezed, lypholized by Sublimation having moisture <10%.

Sale Price: One time non-exclusive license fee per client (Negotiable)
Royalty: Negotiable

CAMEL MILK LASSI

Raghvendar Singh, Gorakh Mal and Devendra Kumar

ICAR-National Research Centre on Camel, Bikaner

Email: drshirish009@gmail.com, Phone: 0151-2230183; 9414052404

- Processed milk fermented with, mix culture
- Homogenized
- Sweetened and flavoured

Sale Price: One time non-exclusive license fee per client (Negotiable)
Royalty: Negotiable
Area specific mineral formulation for yak feeding is prepared with zinc (Zn), copper (Cu), cobalt (Co) and manganese (Mn) in the ratio of 40:20:2:1. Soil, feed and fodder of yak rearing regions are found deficient in certain trace minerals, therefore, hampering animal health and productivity. The above mentioned area specific mineral formulation is already proved to improve the yak health and production. Area specific minerals can further be supplemented in complete feed blocks made through locally available feed resources. This has an additional advantage of an ease in transport and storage in difficult hilly terrain due to compact size of voluminous feed.

Sale Price: Rs.70.00/Kg
Royalty: NA

FUNCTIONAL PANEER FROM YAK MILK

Yak milk paneer is usually prepared with full fat milk having as high as 8.5% fat resulting in 25-30% fat in paneer. Increasing concerns among health conscious consumers demand development of low fat paneer. Interestingly, low fat paneer prepared from yak milk having 1% fat has very hard texture. Therefore, the effect of dietary fibers in improving the product quality of low fat paneer along with enhancement of dietary fiber content of the low fat paneer was
undertaken. Increased fiber content in the product may have the health benefits like prevention against cardiovascular diseases and colon cancer etc.

**Sale Price:** Rs.300.00/Kg

**Royalty:** NA

**HEALING TOUCH-A POLYHERBAL WOUND HEALER AND FLY REPELLANT**

*ICAR-National Research Centre on Yak*

*Email: drpranabjyotidas@gmail.com, Phone: 03780-242389 (Ext-221); 9402283632*

A polyherbal preparation is prepared using extracts of different medicinal plants like *Rubus idaeus, Allium sativum, Saussurea costus* and *Azadirachta indica*, Geranium oil, Calendula and Creosote for external wound healing in the farm animals like yak, hill cattle and mithun. Its clinically efficacy was also proven in surgical wounds and its external application was also found effective to provide much needed relief for the hot painful swelling of the udder in mastitis.

**Sale Price:** Rs.400.00

**Royalty:** NA

**YAK MILK WHEY BEVERAGES INCORPORATED WITH KIWI FRUIT PULP**

*ICAR-National Research Centre on Yak*

*Email: drpranabjyotidas@gmail.com, Phone: 03780-242389 (Ext-221); 9402283632*

Whey is a rich source of nutritional and functional components. Whey collected in yak paneer and chura preparations is utilized for making beverages. Beverages from yak milk whey was formulated with 15% sugar, 0.1% coco powder, 0.2% salt, 0.015% caramel flavour,
0.05% alpha-tocopherol and enriched with natural vitamin C by addition of kiwi fruit pulp.

Sale Price: Rs.20.00 (250 ml)
Royalty: NA

HAND KNOTTED YAK COARSE HAIR CARPETS/WALL HANGINGS AND FOOT MATS

ICAR-National Research Centre on Yak
Email: drpranabjyotidas@gmail.com, Phone: 03780-242389 (Ext-221); 9402283632

Carpets/wall hangings and foot mats are prepared from coarse yak hair fibre with beautiful designs by hand knotted method.

Sale Price: Rs350/ft2
Royalty: NA

FEED BLOCK

ICAR-National Research Centre on Yak
Email: drpranabjyotidas@gmail.com, Phone: 03780-242389 (Ext-221); 9402283632

Complete feed block is defined as the solid/compressed product containing roughage and concentrate in desired proportion capable to fulfil the nutrient requirements for target animal production. It is possible to formulate complete feed block for feeding to the animals using straws and other feed ingredients such as molasses, concentrate, mineral mixtures and salt. These complete feed blocks may be made into customized size and shape. It may be square, circular or quadrangle
depending upon type of dye used in the pressure applying machine. Such feed blocks can be stored over a long period of time and transported economically over long distances. These could be stored in large quantities in less space. The ingredients for preparation of complete feed block (CFB) can be divided into major and minor component. Major component are roughage and concentrate which are mixed in different proportion depending upon the production level of the animal while the minor components are micronutrients and feed additives. The first step in the process of making CFB is the grinding and mixing of concentrate ingredients separately. Feed resources i.e., roughages, concentrate are incorporated properly, mixed with desired proportion. The mixed materials are then put in feed block machine to apply pressure for densification. Different capacities and different efficiencies of CFB preparing machines are available in India. These machines can produce feed block weighing form 5 to 28 kg. Portable CFB machine is also available (Plate 3) which can be fitted on a tractor trolley and can be move from one place to another place. The capacity of portable CFB machine varies from 50 kg per hour and weight of single CFB varies from 1.0 to 2.5 kg.

Sale Price: Rs.35.00/block (Each block 2 Kg)
Royalty: NA

A KIT FOR PARENTAGE VERIFICATION IN GOATS

Ramesh Kumar Vijh, Priyanka Banerjee, Jyoti Joshi, Shivani Rana and Upasna Sharma

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The goats are multiparous animals. The goats give birth to twin, triplets and even quadruplets are not uncommon. The only known procedures to record the parentage in goats is the use of records of the kids born to does inseminated with semen of specific bucks. These records are maintained in the organized herds, research Institutions and other commercial farms. In the well organized herds the kids born are tagged and a number is provided to each kid and the records of the does and
bucks are also maintained in the electronic database. The present invention relates to a kit for determining parentage in goats using distinct microsatellite loci. Currently, parentage testing in domestic animals is based on exclusionary techniques using genetic markers. An offspring is tested assuming one known parent and one or a limited number of candidate parents. If only one candidate parent is left non-excluded, that parent is assigned parentage to the offspring. Although one non-excluded parent may be the true parent, there exists the possibility that other non-excluded candidate parents exist in the population but were not considered. A likelihood based testing procedure is more appropriate for situations in which there are many candidate parents and obtaining a known parent is difficult. Using likelihood based procedures, all potential parents are considered as candidates and there is no need to identify a known parent prior to testing. The present invention includes a method of determining parentage in goats using microsatellite loci. These loci were selected as set forth below and may be used in any type of parentage testing in which allelic variation is used to determine the likelihood of parentage. Preferred methods of detecting the specific alleles in the offspring and potential parents are described below, but alternative methods may also be employed. When used with the methods described below, the indicated levels of certainty are achieved. Alternative methods may result in differences of certainty if the methods change the probability that allele assignments are correct. One skilled in the art will be able to select alternative methods of detecting specific alleles which result in a desired level of overall parentage certainly.

**Suggested price of technology:** Negotiable

**Royalty:** (with or without royalty. If with royalty, suggest % for sale price to be charged): Negotiable

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**A KIT FOR PARENTAGE VERIFICATION IN INDIAN RUMINANT LIVESTOCK**

*R.K. Vijh, Priyanka Banerjee, Jyoti Joshi and Upasna Sharma*

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Parentage analysis of livestock animals is becoming increasingly important in animal husbandry to improve the accuracy of selection and to select sires to increase production and reproduction traits. Increased use of Artificial Insemination and selection of superior males for various economic traits are the basic established
tenets of scientific animal breeding. Recent times have seen usage of DNA based markers for parentage control especially in horses, canines and cattle for which the commercial kits are available. No parentage verification kit was available for other livestock species.

We have developed a single parentage verification kit for all the ruminant livestock species which include cattle (B. indicus, B. taurus and B. indicus X B. taurus crosses), sheep (Ovis aries), goat (Capra hircus), yak (Bos grunniens), mithun (Bos frontalis) and buffalo (Bubalus bubalis). Till date there is no single kit meant for all the six livestock species.

We screened a large panel of microsatellite from cattle genome database. We selected a set of markers which amplified in six species of ruminant livestock which were cattle, sheep, goat, buffalo, yak and mithun. Eleven microsatellites were finally selected that could be simultaneously amplified in all the six ruminant species of livestock. The utility of the microsatellite markers were tested on populations of all the six livestock species. The probability of exclusion based on the set of 11 microsatellites was estimated in all the six livestock species.

Suggested price of technology: Negotiable

Royalty (with or without royalty. If with royalty, suggest % for sale price to be charged): Negotiable

**QTLS FOR MILK YIELD IN BUFFALOES**

*Ramesh Kumar Vijh, Priyanka Banerjee, Jyoti Joshi and Upasna Sharma*

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The present invention relates to identification of QTL for milk yield in buffalo (Bubalus bubalis) using microsatellite markers. A core set of 20 microsatellite markers from BTA6 (BBU7) and BTA9 (BBU10) from cattle genome database were identified and were amplifiable in buffaloes. Genotyping was done on a reference population by selection of daughters of 12 sires (half sib family) of buffaloes; the bulls were selected from the breed tract of Murrah buffaloes. The phenotypic records of milk yield of 1243 buffaloes were obtained and verified for normal distribution. The data was subjected to analysis using single marker analysis using QTL cartographer, interval mapping using R/qtl and meta-QTL analysis using Biomercator. The QTL positions obtained in BBU7 were between 40-60 and 80-
The QTL peak positions were identified between 40-60cM and 80-100cM in BBU10. The peak positions were confirmed by meta-analysis using Biomercator and Joint trait analysis using QTL Cartographer.

**Suggested price of technology:** Negotiable

**Royalty** (with or without royalty. If with royalty, suggest % for sale price to be charged): Negotiable

### QTLS FOR SOMATIC CELL COUNT IN BUFFALOES

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The present invention relates to identification of QTL for increased somatic cell count in buffalo (Bubalus bubalis) using microsatellite markers. A core set of 20 microsatellite markers from BTA9 (BBU10) and BTA14 (BBU15) from cattle genome database were identified and were amplifiable in buffaloes. Genotyping was done on a reference population by selection of daughters of 12 sires (half sib family) of buffaloes; the bulls were selected from the breed tract of Murrah buffaloes. The phenotypic records of milk somatic cell count of 1678 buffaloes in 3 different phases of lactation were obtained. The mean value of the records of three different stages of lactation was then subjected to analysis for detection of QTL. The scale transformation of the somatic cell count data to somatic cell score was made to make a normal distribution and to remove the non-additive interactions. The data was subjected to analysis using single marker analysis using QTL cartographer, interval mapping using R/qtl and meta-QTL analysis using Biomercator. The QTL positions obtained in BBU10 were between 40-60 and 80-100cM while QTL peak positions were identified between 20-30cM and 50-60cM in BBU15.

**Suggested price of technology:** Negotiable

**Royalty** (with or without royalty. If with royalty, suggest % for sale price to be charged): Negotiable
QTLS FOR MILK FAT PERCENT IN BUFFALOES

Ramesh Kumar Vijh, Priyanka Banerjee, Jyoti Joshi and Upasna Sharma

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The present invention relates to identification of QTL for milk fat percent in buffalo (Bubalus bubalis) using microsatellite markers. A core set of 39 microsatellite markers from BTA3 (BBU6), BTA6 (BBU7), BTA9 (BBU10) and BTA14 (BBU15) from cattle genome database were identified and were amplifiable in buffaloes. Genotyping was done on a reference population by selection of daughters of 12 sires (half sib family) of buffaloes; the bulls were selected from the breed tract of Murrah buffaloes. The phenotypic records of milk fat percent of 2141 buffaloes were obtained and verified for normal distribution. The data was subjected to analysis using single marker analysis using QTL cartographer, interval mapping using R/qtl and meta-QTL analysis using Biomercator. The QTL positions obtained in BBU6 were between 80-100cM while in BBU7, the QTL peak positions were obtained between 25-60cM and 65-85cM. The QTL positions obtained in BBU10 was 40-60cM. The QTL peak positions were identified between 40 and 60CM in BBU15. The peak positions were confirmed by meta-analysis using Biomercator and Joint trait analysis using QTL Cartographer. The evidence in this study adds confidence and indicates the region of potential interest for finer analysis in buffaloes. This will help to find the compelling evidence to unravel the expression of genes identified which are directly associated with the trait of interest in buffaloes.

Suggested price of technology: Negotiable
Royalty: (with or without royalty. If with royalty, suggest % for sale price to be charged): Negotiable

QTLS FOR MILK PROTEIN PERCENT IN BUFFALOES

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The present invention relates to identification of QTL for milk protein percent in buffalo (Bubalus bubalis) using microsatellite markers. A core set of 39 microsatellite markers from BTA1 (BBU1), BTA3 (BBU6), BTA6 (BBU7), BTA9 (BBU10)
from cattle genome database were identified and were amplifiable in buffaloes. Genotyping was done on a reference population by selection of daughters of 12 sires (half sib family) of buffaloes; the bulls were selected from the breed tract of Murrah buffaloes. The phenotypic records of milk protein percent of 2141 buffaloes were obtained and verified for normal distribution. The data was subjected to analysis using single marker analysis using QTL cartographer, interval mapping using R/qtl and meta-QTL analysis using Biomercator. The QTL positions obtained in BBU1 were between 100-150cM with peak positions at 130cM while QTL positions obtained in BBU6 were 20-40cM with peak positions at 30cM and 60-80cM. The QTL peak positions were identified between 0-40cM in BBU7. In BBU10, the QTL positions were obtained between 60 and 90cM with peak positions at approx 80cM. The peak positions were confirmed by meta-analysis using Biomercator and Joint trait analysis using QTL Cartographer. The evidence in this study adds confidence and indicates the region of potential interest for finer analysis in buffaloes. This will help to find the compelling evidence to unravel the expression of genes identified which are directly associated with the trait of interest in buffaloes.

**Suggested price of technology:** Negotiable

**Royalty** (with or without royalty. If with royalty, suggest % for sale price to be charged): Negotiable.

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**PCR BASED DNA TEST FOR THE DIFFERENTIATION OF CATTLE AND BUFFALO MEAT AND MILK**

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In India, cattle and buffalo are the two livestock species mainly reared as dairy animals, having significant contribution to country’s milk production, because of which India has emerged as the largest producer of milk in the world. Since cattle slaughter is banned in many parts of our country and due to high demand of buffalo meat for domestic consumption as well as export, illegal mixing of cattle meat with buffalo cannot be ruled out. Similarly, there is also possibility of adulteration of buffalo milk into cow milk for economic gains. Therefore it is important to identify and authenticate the species source of meat/milk, being consumed/exported. Not only for that, sometimes vetro-legal disputes would arise which also require the identification of species origin of meat and milk. More with the advent of new
technologies, lots of processed and ready to eat foods are available in the market and for the consumers it is difficult to identify the species origin of the products. Therefore, to safeguard consumers’ rights, a technology capable of detecting mixing of meat as well as milk of buffalo and cattle is the need of the hour. The present technology developed is able to differentiate meat/milk/tissues/genomic DNA of cattle and buffalo origin, utilizing the size differentiation of PCR amplified products from single set of primers simply by agarose gel electrophoresis. To be assured, the test further confirms the origin of samples using second set of primers capable of giving positive and negative test. The test has been validated on large number of genomic DNA of different breeds of buffalo and cattle (including indigenous and exotic) before employing it on meat and milk samples.

**Suggested price of technology:** Negotiable

**Royalty:** (with or without royalty. If with royalty, suggest % for sale price to be charged): Negotiable.
Technologies available
at
ICAR-National Research Centre on Mithun, Dimapur, Nagaland

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1. A Method For Bio-Preservation Of Mithun Hides

2. A Method For Processing Rabbit Pelts And Fur

3. An Energy Efficient Post Tanning Process For Mithun Hides

4. A Novel Method Of Chrome Tannage Of Mithun Hides With Glyoxalic Acid

5. An Improved Method For Chrome Tanning Mithun Hides

6. A Process Of Making Leather Without Any Large Machinery

7. A Method Of Removal Of Chromium From Chrome Liquor Obtained After Processing Of Mithun Hides

8. A Method Of Processing Rabbit Fur On Leather
Glimpses of Technology Transfer Events

Transfer of technology of strip based tests for detection of adulteration in milk dated 11.12.2015


Transfer of technology of Misti Doi dated 3.12.2015


Transfer of technology of (i) Whey Jaljeer Drink, (ii) Misti Doi, (iii) Improved Texture Doi, (iv) Bajara Lassi dated 19.05.2015
For details please contact:

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