Developments in Indigenous Dairy Products

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The importance and completeness of milk as a human food was realized prior to '*Vedic*' times itself. This recognition of the socio-economic eminence of milk in human nutriture instinctively led ancient Indians to conserve such nutrients into more stable products under the tropical climatic conditions. The concerted efforts towards such accomplishment included concentration, fermentation, acid coagulation, use of preservatives such as sugar and fillers like flour, rice, etc. This resulted into introduction of an array of products, some of which are peculiar to India. Presently around 150 types of milk based sweet meats are available in the country. Their place in the dietary regime as well as socio-economic connotations remains significant through cultural heritage. It goes without saying that in India, no festival or marriage is complete without serving milk-based sweets. There is also a growing trend and interest in exporting traditional milk-based sweets.

The dairy industry in India has taken rapid strides during the last decades. Today, India is the world's largest milk producer which contributes to about 15 per cent of the total world milk production. About half of India's total milk production is utilized in the preparation of different traditional dairy products. There is a growing demand for safe, nutritious, health promoting convenience milk products.

The methods employed over the years for the production of indigenous dairy products were essentially suitable for the scale of operations involved in ancient times. The equipment employed were likewise simple in design and easy to fabricate. The technologies for their manufacture on small scale have been developed through the experiences gained over a long period.

They generally use the batch method for product preparation, ignorant of the importance of raw milk quality or principles of hygienic manufacturing practice and packaging. Chemical composition and organoleptic properties of indigenous milk products also vary to a great extent. Microbiological quality defects along with occurrence of pathogens are commonly observed in most traditional milk products produced in rural India.

Now-a-days, with rapid expansion of urban and semi-urban areas, the demand for traditional dairy products is increasing at a fast pace. Inspite of the fact that the dairy industry has made rapid strides in the last 3-4 decades, the method of manufacture of the traditional products have remained essentially unchanged. Hence, the small-scale producers find it difficult to cope up with the increasing demand. Therefore, in recent times, attention is being focussed either to scale up the operation or to modify the technology so as to make it amenable to mechanization and continuous operation. These, innovations can best be made by adopting suitable technologies that are already existing. Findings of researches on other similar types of food need to be explored for their judicious application under the Indian conditions. Moreover, in modern times, packaging has been identified as an integral part of processing in the food industry. Exploitation of combination of some of these areas could be advantageously used to enhance the shelf-life of the product manufactured.

However, attempt on these lines should produce the product matching in taste, texture and overall quality with the product traditionally produced by the unorganized sector which is a challenging job. The high price commanded by the traditional trade for its products, because of its 'freshness', provides an opportunity to concentrate on the quality of the products which can also improve the viability of the dairy industry. This can be understood from

the fact that the cost of raw materials, including milk and sugar, accounts for over two-third of the sale price of western type dairy products, whereas for traditional milk based products, it is only about one-third of the sale price. Looking to above facts, a stride which can enable the organized sector to launch the indigenous milk products on an industrial scale can have far reaching impact on the dairy industry as well as on socio-economic condition of milk producers in the country.

In absence of standardized production technology, the products have very short shelf life and hence their production may be only seasonal or is catered to on prior orders. Therefore, tremendous scope exists for growth and expansion of the market for these products, provided the quality and safety are ensured and shelf life is extended to facilitate distribution over distant areas.

Recently, the organized dairy sector has shown keen interest in production technology for indigenous milk products, which is reflected from the fact that indigenous product specific plants have been set up by dairy organizations. Indigenous milk products have also received attention on research front at national level. This is evident from the fact that the Indian Council of Agricultural Research, New Delhi had sanctioned a network project on indigenous milk products entitled "Research and Development Support for Process Upgradation of Indigenous Milk Products for Industrial Application." SMC. College of Dairy Science was one of the centers for the project and several studies have been conducted, the outcome of which is included here for the presentation.

Characterization

Traditional Dairy products from western part of our country are characterized for their method of manufacture, chemical composition, physical (including textural) attributes, their conventional packaging and their shelf life. The products which are well documented are: *Basundi, Peda, Shrikhand, Gulabjamun, Halvasan, Thabdi and Ghari*. The work to enhance the yield of products such as Paneer and preparation of ready-to-serve type Carrot Halwa is also going on.

Process Standardization

Basundi

The standardized process for the manufacture of Basundi comprised of standardization of buffalo milk (0.50±0.01 fat : SNF ratio), forewarming of milk (90°C, 10 min), partial concentration of milk to ~2X the original milk TS, addition of sugar (5 per cent, w/w of milk), final concentration to ~2.5X (the original milk TS inclusive of sugar), homogenization (75 kg/cm^2, 65°C), addition of stabilizer (Na_2HPO_4. $2H_2O$, @ 0.3 per cent, w/w), packaging in glass bottles, post-production heat treatment (90°C, 10 min), cooling and storage at 7±2°C temperature which is recommended for commercial application.

Halvasan

Milk is taken in a Karai and added with the mixture of required quantity of Maida and Fada at lukewarm temperature. Any lumps formed are brocken and mixture is heated gently. The temperature is maintained at 90^0 C so as to allow the mixture to curdle and cook gradually. During this period gentle stirring of the mixture is continued taking care to prevent any breakage of lumps formed as well as prevent it to stick and burn at the bottom. Also care is taken to avoid surface drying of the lumps formed by wetting them using separated liquid of the mixture during stirring. After Fada is cooked, it will have a spongy texture like a soft junket. The coagulated junket formed is broken into small lumps by agitation and boiling. At this time calculated amount of crystal sugar is added and boiling continued with intermittent stirring. With continuous fast boiling and slow stirring at ~ 100^0 C, moisture is evaporated. The sides and bottom of the Karai is continuously scrapped to avoid formation of any burnt particles.

The mass is allowed to cool at room temperature by spreading on the whole surface of the karai. After cooling, it is removed from the Karai and flavouring and colouring ingredients such as Nutmeg, Cardemom and Saffron, etc. are added as required. The mixture is formed into he required size of pieces ~ 20-25 gms in round flat shape and garnished with chopped pieces of Cashew Nut, Pistachio, Pisti, Almond, etc.

Thabdi

Fresh, usually buffalo milk is taken and filtered in the kettle and boiling of the milk is started. In the boiling milk, ~ 80 g sugar per liter of the milk is added. Vigorous heating is continued until the mixture becomes viscous. Desiccate the viscous mass on high flame such that within a short period, it reaches to pre-pat formation stage. At this stage heating is stopped and the mass is kept undisturbed for ~ 15 minutes. During this period small grain formation will take place. The granular mass is again heated moderately and with slow agitation taking care to preserve the grains formed. A small quantity of ghee is added to the grainy mass, heating is stopped and it is again kept undisturbed for ~ 15 minutes to have brown colour and caramelized flavour development. Thereafter, desiccation is completed to adjust the final moisture content in the product. The product-Thabdi is then allowed to cool and formed into pieces and decorated with chopped pisti. The Thabdi is then packed appropriately or kept as such in the trays for storage and served.

Kalakand

Good quality *Kalakand* can be prepared using milk standardized at 5.90 per cent fat and 9 per cent of SNF, *Amla* powder addition @ 1.92 g/l and sugar addition @ 6.19 per cent at the time of pre-pat formation. The process results in the development of *Kalakand* of highly acceptable quality having Amla powder as coagulant which is devoid of any chemical such as citric acid normally used in traditional process of manufacture.

Shelf Life Extension

Shelf life of Thabdi packed in different packages

Shelf life of *Thabdi* using different packaging materials such as Polyester/Al-foil/Polyfilm PE pouches (64µ) (M1), Met-Polyester/Polyfilm PE pouches (106µ) (M2), Polyester/Polyfilm pouches (74µ) (M3) and Polyester/Nylon/Retort CPP pouches (108µ) (M4), the PE box (M5) and Laminated Cardboard box (M6) was assessed. The *Thabdi* samples remained acceptable in all of the packages up to 10 days when stored at 30±2ºC temperature as on 12th day visible mold growth was observed on all *Thabdi* samples. The *Thabdi* samples stored at 7±2ºC temperature remained acceptable up to 56 days in all of the packages and thereafter the textural changes in *Thabdi* made it unacceptable. On the basis of storage related changes in compositional, textural, microbial and sensory attributes, package Polyester/Al-foil/ Polyfilm PE pouches (M1) and Polyester/Nylon/ Retort CPP pouches (M4) proved to be the best packages followed by Met-Polyester/Polyfilm PE pouches (M2), Polyester/Polyfilm pouches (M3), PE box (M5) and Laminated Cardboard box (M6). The cost of packaging for one kg *Thabdi* was observed as rupees 14.7, 10.88, 11.56, 20.76, 4.00 and 2.00 respectively for M1, M2, M3, M4, M5 and M6 packages.

Shelf life of Thabdi Peda

Thabdi Peda were packed in Met-Polyester/ Polyfilm pouches (65µ) and Polyester/Polyfilm pouches (92µ). The product remained acceptable in both of the packages up to 6 days when stored at 37±2ºC temperature as on 9th day, visible mold growth was observed on both the samples in both of the packages. When the samples were stored at 20±2ºC temperature, they remained acceptable up to 20 days in both of the packages and there after the visible mold growth was observed which made it unacceptable. On the basis of storage related changes in compositional, textural, microbial and sensory attributes,the packaging material evaluated exhibited comparatively similar performance. However, Met-Polyester/Polyfilm pouches (65µ) costs 20.12 rupees against Polyester/Polyfilm pouches (92µ) costing 16.72 rupees can be preferred.

Shelf life of Halvasan

Shelf life of *Halvasan* can be extended by 15-20% by filling the product in a PVC tray, inserting in Met-Polyester/PE pouch (106 µm) or Polyester/ PE pouch (74µm) followed by heat sealing the pouches. Under the ambient storage (30± 2^0C), the *Halvasan* packaged as above gives shelf life of 10 days, while under refrigeration temperature (7± 2^0C), the product can be safely stored for almost 42 days.

Shelf life of Paneer

Paneer suitable for use in various Indian cuisines can be prepared by dipping in vinegar or lactic acid for 30 minutes, followed by partial removal of moisture under vacuum (36-38°C)and packaging in LDPE bags of 90 µm thickness. This treatment enhances the shelf life of paneer up to 90 days under refrigerated (7±2°C) storage. Upon rehydration in warm water (55-60°C), the paneer obtained shows similar rheological properties as like fresh paneer.

Packaging of Kalakand employing different packaging systems

Kalakand pieces of ~ 18-20 g each were transferred under hygienic conditions to transparent but rigid re-closable PVC tray packages and these trays were inserted into Pet-Polyester/Polyfilm (~ 85 µ) pouches. Both the trays as well as pouches used were pre-sterilized in the UV chamber to avoid contamination through packages. The filled pouches having trays were treated with partial vacuum to remove the head space gases and simultaneously flushed with N_2 or CO_2 gas and immediately heat sealed to make an airtight joint. On the basis of storage related changes in compositional, physico-chemical, textural, microbial and sensory attributes, it was found that the use of CO_2 gas to replace O_2 in head space as compared to N_2 and keeping the product under refrigeration (7±2°C) conditions tends to enhance the shelf life of *Kalakand* up to 40 days. Its shelf life was attained only up to 25 days when stored at 20±2°C temperature. The cost of packaging *Kalakand* under N_2 and CO_2 environment and stored at 20±2°C as well as 7±2°C temperature comes to 13.61rupees/ Kg for N_2 and 14.57 rupees/ Kg for CO_2 gas *Kalakand* respectively.

Conclusion

In today's market, it is not only the technological improvements but also varying demographics, market demands for ready-to-serve type novel products and consumer opinions drive the innovations in indigenous dairy products. Thanks to the growing domestic market in India and the enormous investments flowing into the organized retail sector, world's best practices in food packaging are going to be accepted which opens up the opportunities. Also, if India want to be successful as a global destination for indigenous dairy products, adoption of universally competitive cutting edge technologies in packaging will become more imperative and challenging. The current and the advanced trends in packaging solutions for the dairy industry are not enough. Modernisation in packaging of indigenous milk products is the need of the hour in our country, in order to efficiently address our big distribution lacuna. The decision in dairy industry should satisfy the changing needs of the consumers, suppliers and manufacturers at one go.