



Optimization of the proximate ingredients of *Rabri* - An energy rich traditional Indian dairy product based on sensorial analysis

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ABSTRACT : In this study, the effect of milk on the proximate composition of *Rabri* was done using three samples of milk obtained from cow, buffalo and mixed milks from both (50:50) and the *Rabri* samples were evaluated for their nutritional ingredients. The quality of *Rabri* produced from buffalo milk was found to be superior to *Rabri* produced from cow milk and their mixture. The composition of *Rabri* (from buffalo milk with 6 % added sugar) was 34.49 per cent moisture, 20.33 per cent fat, 9.87 per cent protein, 30.93 per cent Lactose/sucrose, 2.14 per cent ash and 63.27 per cent total solids. The sensory evaluation of *Rabri* revealed that the average overall acceptability score for *Rabri* prepared from buffalo milk was highest (7.79) (on a 9-point hedonic scale) followed by mixed milk (7.71) with the least value obtained from cow milk (7.57).

KEY WORDS : *Rabri*, Sensory evaluation, Proximate analysis, Nutritional constituents

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INTRODUCTION

An estimated 50 to 55 per cent of the total milk produced (146.8 million tons in 2015) in India is converted into a variety of traditional milk products including numerous dairy desserts (NDDDB, 2014). These products account for 95 per cent of all the milk products consumed and it is worth noting that the organized dairy industry handles only about 15 -16 per cent of the total milk produced in the country (Rasane *et al.*, 2015). The production of traditional milk products presents unique opportunity to the organised dairy sector in India as they

have a huge appeal and the market for these products far exceeds that of western style dairy products. The consumption of traditional dairy products is growing at an annual growth rate of more than 20 per cent, but for the western dairy products the growth rates are relatively much lower (5 -10%) (Patil, 2009). Traditional Indian dairy products can be classified into six categories based on the principle of manufacture (Nawajeevan and Rao, 2005 and Pal and Raju, 2007): 1- Heat desiccated products, 2- Heat and acid coagulated products, 3- Fermented products, 4- Products made with addition of cereals , 5- Clarified butter fat (*Ghee*) 6- Frozen products.

Heat desiccation is the most ancient technology used to process the milk and milk products. Scriptures from the early Buddhist and the Jain period have documented sweets made from heat -desiccated milk. These have been used as desserts at the end of meals. Lord Buddha allowed his followers to take sweets as a portable ration

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for journeys on routes where it was difficult to get foodstuffs. Heat desiccated milk products have thus, been traditionally produced in Indian sub-continent since ancient times. Milk and milk products constitute important nutritional components which serve as the source of first class proteins especially for children and vegetarians (Karthikeyan and Pandiyan, 2013). It also contributes to essential elements such as phosphorus, calcium etc.

Rabri, one of the most commonly preferred heat desiccated sweet product which is used as the raw material for a variety of other sweets. *Rabri* is concentrated and sweetened milk product, that constitutes many layers of clotted cream. The basic methodology as given by Khaskheli *et al.* (2008) denotes to fresh cream milk heated in wide pan to bring it to boil. A thin layer of clotted cream formed on the surface of milk clotted from time to time with thin wooden stick. The layer of cream clotted on the edge of pan is placed one over the other. This process is continued until 1/6 of original milk is left. Sugar 5-6 per centth by weight of original milk is added and dissolved the same. The clotted cream called malai is scrapped off from the edge of the pan and immersed in thick sweetened milk and stored till marketing (Prasad, 1997). However, the process of preparation of *Rabri* may differ from region to region and that is why the concentration of *Rabri* varies greatly. Beside the above fact, the initial composition of milk from which it has been manufactured, the degree of concentration of milk solids and the percentage of sugar added may also affect the composition of *Rabri* (Khaskheli *et al.*, 2008). It is creamy white to caramel in colour, having chewy texture and a pleasantly sweet flavour (Chatterjee *et al.*, 1994). It is consumed majorly in north indian regions for its rich taste and its nutrient value can be enhanced by garnishing with apricots, almonds and dates. It has been considered one of the major and widely produced specialized product of halwais (Indian sweet makers) or traditional confectionaries. Presently, its manufacture is confined to only non-organized sector. Its traditional method of production is both, labour and energy intensive and the product thus obtained, is non-uniform in quality and has low keeping quality (Chauhan *et al.*, 2014a). Also, very less emphasis is given on the correct sanitation measures taken during the traditional process (small scale production) in terms of

manufacturing techniques. In view of its importance in the Indian subcontinent and non-availability of any standardized process for its manufacture, it was proposed to take up this project. Once the method of manufacture and the quality aspects of *Rabri* are standardized, it may be possible to produce *Rabri* in a batch process on a very large scale all over the Indian subcontinent, suitable for commercial conditions.

Efforts have also been made to commercialize the manufacturing of *Rabri* by employing scraped surface heat exchanger (SSHE) for concentration of buffalo milk and addition of shredded chhana/paneer in place of clotted cream to provide the desirable texture to the final product (Gayen and Pal, 1991b). Also, Pal *et al.* (2005) successfully developed a technology for the large scale development of *Rabri* using thin film scraped surface heat exchanger (TSSHE). It involved standardization of buffalo milk to 6 per cent fat, addition of sugar at 6 per cent to preheated (85-90°C) milk and concentrating in TSSHE upto 50 per cent solids, addition of shredded paneer, packaging in hot condition (80°C) and immediate cooling. Recently, a study was conducted to determine the feasibility of mechanized production of *Rabri* and to compare it with the conventional method. SSHE with high heat transfer co-efficient was selected for initial concentration of milk (30% TS). Sugar was added at the rate of 5 per cent of initial milk quantities. Chopde *et al.* (2013) found that a uniform quality product in respect of flavour, body, texture, colour, appearance and overall acceptability was obtained by combined system of automation and conventional system whereas a slightly brown, cooked flavour and non-uniform product was obtained by conventional method.

This study focuses on optimizing the proximate ingredients of *Rabri* which is an energy rich traditional Indian dairy product based on sensorial analysis.

MATERIAL AND METHODS

Sample collection :

Three kinds of milk samples namely: cow, buffalo and mixed milks (cow and buffalo) in the ratio 1:1, were taken for the preparation of *Rabri*. Three levels of sugar (4%, 6 % and 8%) were added to the aforesaid samples of milk. Taking 3 replications, a total of 27 *Rabri* samples were prepared. The experiment was conducted in three replications to ensure uniformity and consistency in results.

Rabri preparation :

The method described by Aneja *et al.* (2002) with slight modifications at our own level was utilized for the preparation of *Rabri*. Five kilogram of milk sample with specified composition was taken in a shallow pan and was kept over an open fire. The milk was allowed to slowly evaporate, without being stirred, with frequent scraping at the bottom. The surface of milk, simmering in Karahi (Pan), was intermittently fanned to permit formation of skin. Pieces of skin were continuously broken up and moved to cooler parts of the karahi. When the desired body and texture was developed and the volume of milk was considerably reduced, sugar was added. The layers of the clotted cream were immersed in the remainder of the concentrated milk. Then, the whole mass was heated for a short period to mix the clotted mass uniformly into the concentrated milk. It was then garnished with nuts and saffron and served in chilled condition. Fig. A shows the process flow chart for the manufacture of *Rabri*.

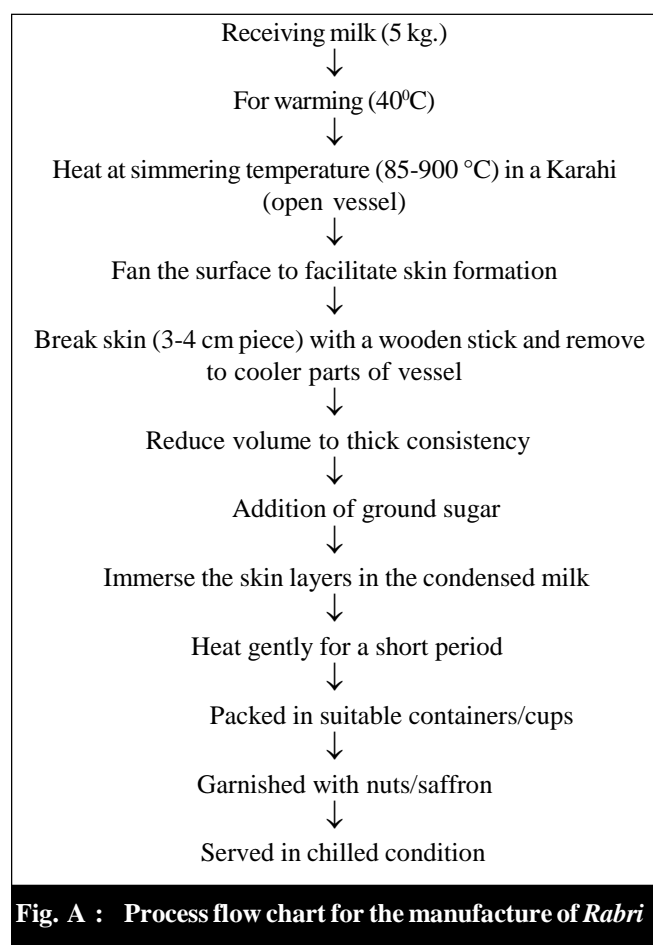


Fig. A : Process flow chart for the manufacture of *Rabri*

Chemical analysis:**Proximate analysis:**

Each *Rabri* sample was analyzed for total solids (TS) content, ash and protein content (Association of Official Analytical Chemists; AOAC, 2000), fat content [IS 1224 (part II) (1997)], moisture content [IS SP: 18 (part XI) (1981)] and lactose/sucrose (by difference: Lactose/sucrose % = TS % - (Fat% + Protein% + Ash%).

Sensory analysis:

The *Rabri* samples were served to a panel of five judges for sensory evaluation. The judges were first trained in the evaluation of *Rabri* according to 9-point hedonic scale. The product was also served to 150 randomly selected consumers in 100 g cups to know their response about the product regarding its colour, texture, appearance, sweetness and overall acceptability on a 9-point hedonic scale. Another study on the effect of milk on sugar on physic qualities of *Rabri* concluded that the combined effect of milk and sugar affects the score of flavour, sweetness and overall acceptability (Chauhan *et al.*, 2014b).

Statistical analysis:

The statistical analysis of data obtained in the experiments was analyzed by a factorial design given by Snedecor and Cochran (1980) and have been summarized in Table 1.

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Proximate composition :

The yield and proximate composition obtained in this study are presented in Table 1. The average yield of *Rabri* from cow, buffalo and mixed milks were 28.43, 30.13 and 29.33 per cent, respectively. It appears that the yield varied significantly ($P < 0.05$) on account of milk from species namely: cow, buffalo and mixed milk and also from the levels of sugar added. The interaction effects were also found to be significant. Thus, it is optimized that buffalo milk with 6 per cent sugar found to be best option in terms of composition (34.49% moisture, 20.33% fat, 9.87% protein, 30.93% sugar/lactose, 2.14% ash and 63.27% TS). The chemical compositions such as fat, protein, sucrose, ash, minerals etc. of some of the commercial milk products like *Rabri* showed wide variations (Chatterjee *et al.*, 1994).

Chemical characteristics of the products generally has been found to be dependent on the nature of ingredients/constituents, quality of the raw materials and the extent of heat treatment during processing. Pandya and Khan (2006) also suggested that a well-made *Rabri* contains around 51 per cent TS, 11 per cent lactose, 16 per cent fat, 10 per cent protein, 12 per cent sucrose, 1.9 per cent ash, 0.31 per cent acidity (lactic acid). Gayen and Pal (1991a) found that *Rabri*, is made of buffalo milk, the gross composition (%): moisture 49.8, fat 15.5, protein 9.50, lactose 11.3, sucrose 12.0 and ash 2.0.

Sensory evaluation:

The results of sensory evaluation of *Rabri* rated by panel of judges are shown in Table 2. According to the sensory analyses, the average overall acceptability score for *Rabri* prepared from buffalo milk was highest *i.e.* 7.63 followed by 7.48 from mixed milk and 7.30 from cow milk. Table 2, also indicates that *Rabri* prepared

from buffalo milk having 6 per cent sugar scored the maximum score *i.e.* 7.79 on 9-point hedonic scale. This is due to high total milk solids and superior taste in buffalo milk. The effect of milk on sugar on physic qualities of *Rabri* concluded that the combined effect of milk and sugar affects the score of flavour, sweetness and overall acceptability. The results of the present study are in conformity with findings of Gayen and Pal (1991a). The consumers acceptability trials (Table 2) conducted on the *Rabri* prepared from buffalo milk having 6 per cent sugar revealed that out of 150 consumers 36.00 per cent rated it as “liked extremely”, while 57.33 per cent valued it as “liked very much”. Only 6.67 per cent found it as “liked moderately”. None of the 150 randomly selected consumer rated the product below the “liked moderately”.

The cow milk used in this study was found to have an average of 4 per cent fat and 8.5 per cent solids-not-fat (SNF). The respective values for buffalo milk were 7 per cent fat and 9.5 per cent SNF and for mixed milk the

Table 1 : Yield and proximate composition (%) of *Rabri* samples prepared from different types of milk

Treatment	Yield	Moisture	Fat	Protein	Sugar	Ash	Total solids
Cow milk							
4% sugar	26.63±0.125	44.44±0.577	15.70±0.216	9.70±0.497	28.04±0.127	2.12±0.110	55.56±0.371
6% sugar	28.63±0.309	43.22±0.298	14.74±0.260	9.70±0.222	30.20±0.012	2.14±0.102	56.78±0.472
8% sugar	30.03±0.618	41.89±0.777	12.97±0.250	9.87±0.301	32.83±0.291	2.44±0.291	58.11±0.272
Buffalo milk							
4% sugar	28.13±0.492	35.13±0.165	21.00±0.510	9.53±0.082	32.31±0.033	2.03±0.125	64.87±0.320
6% sugar	30.30±0.283	34.49±0.673	20.33±0.250	9.87±0.151	30.93±0.234	2.14±0.016	63.27±0.247
8% sugar	31.97±0.450	32.52±0.417	19.59±0.170	9.79±0.061	35.87±0.540	2.23±0.057	67.48±0.301
Mixed milk							
4% sugar	27.66±0.125	41.70±0.801	18.37±0.262	9.73±0.231	28.09±0.120	2.11±0.050	58.30±0.900
6% sugar	29.33±0.250	37.32±0.185	17.83±0.287	9.83±0.075	32.80±0.240	2.22±0.027	62.68±0.080
8% sugar	31.20±0.216	35.26±0.408	14.43±1.011	9.68±0.100	38.23±0.030	2.40±0.287	64.74±0.411

Table 2: Sensory quality of different types of *Rabri* samples

Treatments	Flavour	Body of texture	Colour and appearance	Sweetness	Overall sensory quality
Cow milk					
4% sugar	6.97±0.05*	6.93±0.04	7.03±0.05	6.42±0.05*	6.82±0.04
6% sugar	7.25±0.03	7.87±0.04	7.39±0.07	7.43±0.05	7.57±0.04**
8% sugar	7.60±0.05	7.66±0.05	6.91±0.07	6.94±0.04	7.15±0.05
Buffalo milk					
4% sugar	7.71±0.05*	7.41±0.04	7.63±0.04	7.13±0.04	7.44±0.05
6% sugar	8.38±0.05	8.05±0.05	8.02±0.05	7.99±0.05	7.79±0.07**
8% sugar	8.05±0.06	7.51±0.05*	7.68±0.04	7.42±0.04	7.66±0.05
Mixed milk					
4% sugar	7.56±0.04	7.04±0.06	7.24±0.05*	6.77±0.05	7.13±0.05
6% sugar	8.23±0.06	7.87±0.06	7.79±0.05	7.75±0.05*	7.71±0.04
8% sugar	7.98±0.04	7.63±0.05	7.15±0.04*	7.17±0.05	7.61±0.04

Mean±S.E. with different asterisk (*) and (**) differ significantly (P<0.05)

Values are Mean ± SD

values were 5.5 per cent fat and 9.0 per cent SNF. Sensory evaluation showed that *Rabri* prepared from buffalo milk having 6 per cent sugar obtained the highest score and acceptability. Consumer's acceptability trials revealed that the product was highly appreciable.

Conclusion:

The process for the preparation of *Rabri* has been standardized as per Fig. A. The buffalo milk proved to be better in the preparation of *Rabri*. The consumer's response to this product was highly acceptable. *Rabri* obtained from buffalo milk was found to have good nutritional value with respect to fat, proteins, sugar and total solids. Moreover, *Rabri* obtained from buffalo milk revealed its superiority in all respects as the average overall acceptability score was found to be highest. An optimum level of 6 per cent sugar added in *Rabri* achieved a maximum score (7.79) by the panel of selected judges in its sensory evaluation. Further experiments are to be done to devise an accurately standardized process for production of *Rabri* at a large scale.

Conflict of interests:

The authors did not declare any conflict.

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