MedCrave
Step into the World of Research

Journal of Dairy, Veterinary & Animal Research

Process Standardization for the Manufacture of Mango flavoured steamed Sweetened Concentrated Yoghurt (*Bhapa dahi*)

Abstract

A The present investigation was carried out with the objective of developing a 'value-added' mango flavoured sweetened concentrated yogurt (SCY referred to in India as Bhapa dahi) based on chakka(an intermediate dairy product obtained by partial draining of whey from yogurt) and sweetened (partly skimmed) condensed milk (SCM). Bhapa dahi was prepared adopting the process standardized by Bhattacharya et al. [1]; the modifications being substituting plain condensed milk with SCM and increasing the steaming period. The process standardization involved

(i) Selecting the thermophilic starter culture from amongst Y-170F, Yo-Flex and Y-480F,

(ii) Choosing the best admixture of *chakka* and SCM from amongst three proportions (viz., 40:60, 45:55 and 50:50 w/w), and

(iii) Selecting the optimum steaming treatment required to obtain a gelled fermented product. The rate of addition of mango pulp was kept constant at 18.0 % by weight of base mix (i.e. *chakka* plus SCM).

(iv) The SCY samples were subjected to analysis for their proximate composition, texture profile and sensory quality. The standardized process for the manufacture of mango flavoured SCY involved use of Y-170F thermophilic yoghurt culture at the rate of 0.15 g/l of milk to obtain the curd; utilizing *chakka* plus SCM in the proportion of 1:1 (w/w) as the base mix and steaming (cooking) the blend of base mix plus mango pulp for a period of 15 min.

Research Article

Volume 4 Issue 3 - 2016

Patel Ronak[1], Jana AH[2]*, Modha Hiral[2] and Smitha Balakrishnan[3]

[1]*Banas Dairy, India*
[2]*Department of Dairy Technology; Anand Agricultural University, India*
[3]*Department of Dairy Chemistry, Anand Agricultural University, India*

***Corresponding author:** Jana AH, Professor and Head, Department of Dairy Technology, SMC College of Dairy Science, Anand Agricultural University, Anand-388 110, Gujarat, India, Tel: 91-9375012630; Fax: 02692-261314; Email: atanujn@gmail.com

Received: August 24, 2016 | **Published:** December 06, 2016

Abbreviations: FSSA: Food Safety and Standards Act; SCM: Sweetened Condensed Milk; FDM: Fat on Dry Matter; SCY: Sweetened Concentrated Yogurt; PCM: Protein at Constant Moisture; TS: Total Solids; TSS: Total Soluble Solids; DVS: Direct to Vat Starter

Introduction

'*Bhapa dahi*' (steamed concentrated yoghurt, usually sweetened) is a popular Bengali delicacy prepared at domestic level in West Bengal, India. It is basically a steamed sweet *dahi* (similar to Yogurt) and is often called the 'Indian cheese cake'. The traditional recipe for preparation of '*Bhapa dahi*' is time consuming since it involves thickening of the milk by slowly condensing it, setting the *dahi* through the action of starter culture, followed by steaming it to form a gel-like mass. The gelled structure and sweet-acidic taste is characteristic of such product. In the present study, an attempt has been made to formulate a recipe involving *chakka*, SCM and mango pulp and standardize the process for the manufacture of '*Bhapa dahi*' (sweetened concentrated yogurt - SCY). The use of concentrated milk sources avoids the drudgery of concentrating milk involved in the traditional process while the addition of mango pulp (natural source of carotenoids) as flavouring ingredient would further enhance the products appearance and palatability. The scientific research on SCY is very scanty. Only two papers are documented in literature, both by the same scientist [1,2].

Mango, 'The King of fruit' is one of the most popular, nutritionally rich fruit with unique flavor, fragrance, taste and heath promoting qualities. The average composition of ripe mango is 81.0% moisture, 0.6% protein, 16.9% carbohydrate, 0.4% fat, 0.4% minerals, 0.7% crude fiber; the mineral content includes calcium, phosphorus and iron to the tune of 14, 16 and 1.3 mg/100 g [3]. Mango is an excellent source of vitamin A and flavonoids like β-carotene, α-carotene, and β-cryptoxanthin. These compounds together are known to have antioxidant properties and are essential for vision. Vitamin A is also required for maintaining healthy mucus membranes, skin and protects the body from lung and oral cavity cancers. Incorporation of mango pulp (18% TS) at the rate of 7.0-20.0% of product enhanced the flavour and consistency and improved the nutritional value of set yoghurt [4,5].

Materials and Methods

The ingredients used in the manufacture of SCY is as detailed below.

Dairy ingredients

Tea special milk (Amul brand – homogenized milk having 4.5% fat, 8.5% SNF) was procured from Amul Shoppe, Anand, India to prepare the product. Partly skimmed Sweetened Condensed Milk (SCM) (M/s. Nestle Co., brand Milkmaid) packed in tin can was procured from Granary, Anand, India.

Non-dairy ingredients

Lyofast Y480 F and Y170F, both Sacco yoghurt cultures (freeze dried lactic cultures; Cadorago Co., Italy) were used for the preparation of curd. Chr. Hansen Yo-Flex (YF-3331) thermophilic yoghurt culture (freeze dried lactic cultures; Horsholm, Co., Denmark) was also used in the preparation of curd. For the preparation of curd, 1 UC (UC is standard unit) was sufficient to convert 100 l. of milk into yogurt. Alphonso tinned mango pulp (M/s. Vadilal Co., Ahmedabad, Gujarat, India) was purchased from local market in Anand, Gujarat, India.

Mode of incorporation of starter culture in milk

All the three DVS cultures [Yo-Flex, Sacco-1 (Y-480F) and Sacco-2 (Y-170F)] were taken in a sterile beaker covered with aluminium foil. The standardized milk was heated at 90°C for 10 min and then cooled to 42°C. Some quantity of milk was kept aside to activate the culture. Such cultured milk was then added to the rest lot of milk and allowed to incubate at 42±2°C for 5-6 h to form a set curd.

Preparation of *sweetened concentrated yogurt*

All the selected ingredients (i.e. *chakka,* SCM and mango pulp) were weighed accurately as per the calculations based on the formulation (Table 1). Hobart mixer (M/s. Hobart, Corporation, Ontario, Canada, Model No. N 50) operated at two speeds (# 1 – 60 rpm, # 2 – 125 rpm) was used to prepare the base mix (blend of *chakka* and SCM) for SCY. The 'Tea Special milk' containing 4.6 % milk fat and 8.5 % SNF was heated to 90°C for 10 min. The milk was then cooled to 42°C and inoculated with 0.015 % of Lyofast (two types) or Yo-Flex DVS cultures to obtain the curd. The set curd was attained in 5-6 h at an incubation temperature of 42±2°C temperature. The curd was then put over a muslin cloth and hanged for about 10 h (in room maintained at 23±2°C) for permitting the free whey to drain off to obtain concentrated yogurt (i.e. *chakka*). The partly skimmed SCM having 3.9 % fat, and 70.55 % TS was mixed with *chakka* in three proportions (SCM: *chakka*, 40:60, 45:55, 50:50, w/w) in a Hobart mixer. Subsequently mango pulp was added to the base mix and blended in Hobart mixer. The final flavoured mixture (700 g) was filled in stainless steel tray with lid (1 lit. capacity) and subjected to steaming in a pressure cooker (Make - Marlex) without applying any pressure (avoiding weight on cooker) for 15 to 21 min. The concentrated curd got transformed into a firm gel (i.e. *Bhapa dahi*). The product was allowed to cool to room temperature and subsequently shifted to a refrigerator (7±1°C) for storage. Figure 1A & 1B depicts the flow chart for the preparation of *chakka* (one component of base material for *Bhapa dahi*) and mango flavoured sweetened concentrated yogurt respectively.

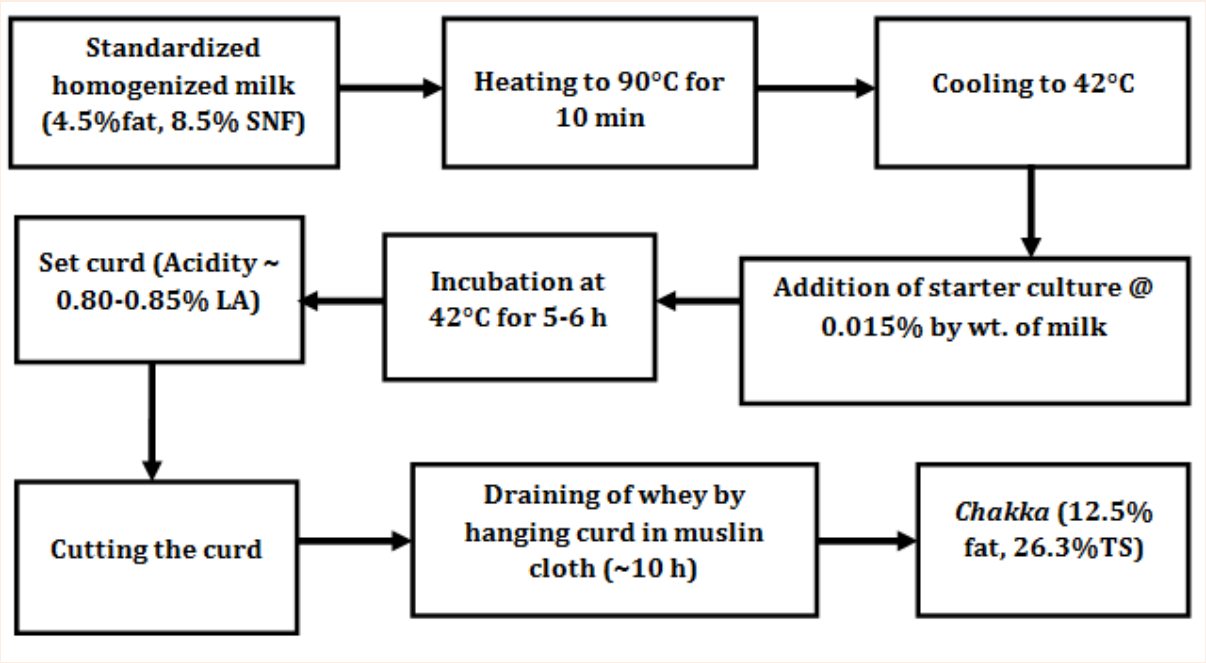

Figure 1A: Flow chart for the preparation of *chakka.*

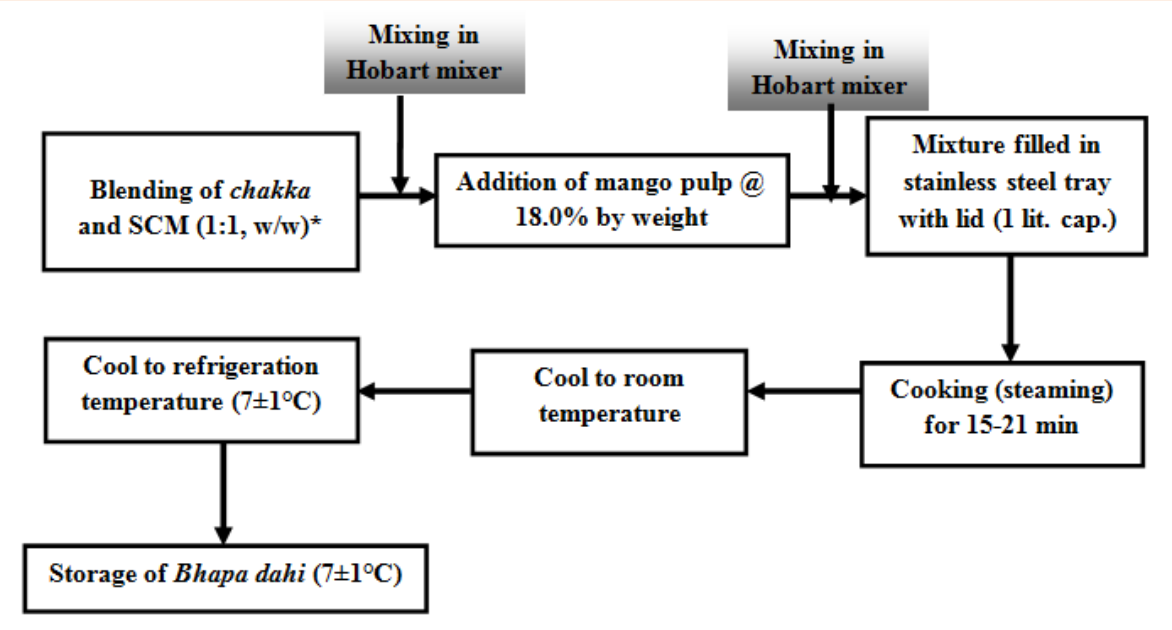

Figure 1B: Flow chart for the preparation of *Bhapa dahi.*
*other proportions tried were 40:60 and 45:55 w/w

Table 1: Formulation of mango flavoured sweetened concentrated yogurt.

Ingredients	Quantity (kg)
Chakka	50.0
Sweetened Condensed Milk	50.0
Mango pulp	18.0
Total	118.0

Analyses of ingredients and final sweetened concentrated yogurt

The analyses carried out for different ingredients and resultant fermented SCY is as given below.

Milk: The representative samples of milk were analyzed for milk fat, Milk Solids-Not-Fat (MSNF) and titratable acidity. The fat content of milk was estimated by Gerber method [6]. MSNF of milk was determined by the standard procedure [7]. The titratable acidity (TA) of milk was determined by the standard method [8] and expressed as per cent lactic acid.

***Chakka*:** The *chakka* was analyzed for fat content, total solids (TS) and TA. The fat content of *chakka* was determined by Gerber method [9]. The TS of *chakka* was determined by the standard procedure using Mojonnier Milk Tester, Model-D [10]. The TA of *chakka* was estimated by standard method [11].

Sweetened condensed milk: The sweetened condensed milk (SCM) was analyzed for fat and TS content. The fat content of SCM was determined by modified Gerber fat test as recommended for *shrikhand* [12]. The TS of SCM was determined by the standard procedure using Mojonnier Milk Tester, Model-D [10].

Mango pulp: The mango pulp was analyzed for TS, total soluble solids (TSS), TA and pH. TS of mango pulp was determined by the standard procedure using Mojonnier Milk Tester, Model-D [10]. The TSS of mango pulp was measured using refractometer (ERMA hand refractometer, Tokyo, Japan; 0 – 32 % scale) at 20°C. For pH determination, 20 g of mango pulp was mixed with 20 ml of distilled water. The pH readings were taken on Digital pH meter (M/s. Mettler Toledo AG, Schwerzenbach, Model No. CH-8603). The acidity of mango pulp was determined by titration method and expressed in terms of per cent citric acid [13].

Sweetened concentrated yogurt: The sweetened concentrated yogurt (SCY) was analyzed for fat, protein, TS, ash, acidity and pH. The total carbohydrate content of concentrated yogurt was obtained by difference. The fat content of product was determined by modified Gerber fat test as recommended for *shrikhand* [12]. The total nitrogen of fermented product was determined using semi-micro Kjeldahl method [14]. Kjel-plus digestion system (Model-KPS 006L) and Kjel-Plus semi-automatic distillation system (Model-Distil M) both from M/s. Pelican Instruments, Chennai was used for the purpose. The per cent total protein was calculated by multiplying the nitrogen with a factor of 6.38. The TS of product was determined by the standard procedure using Mojonnier Milk Tester, Model-D [10]. The TA of SCY was estimated by the standard method [11]. For pH determination, 20 g of product sample was mixed with 20 ml of distilled water and a fine paste was obtained. The pH readings were taken on Digital pH meter (CH-8603, M/s. Mettler Toledo AG, Schwerzenbach). The ash content of SCY was determined following the standard

method [15].

Texture profile analysis of concentrated yogurt: Compression testing of SCY was done using Food Texture Analyzer (M/s. Lloyd Instruments, LRX Plus, England; Sr. No. 160374) using 50 Newton (N) load cell which moved at a speed of 50 mm/min. The trigger was set at 10 gf (1gf =N/0.00980665). The fermented products were subjected to texture measurement after tempering the same at 23±1ºC for an hour in an air-conditioned room (23±1ºC, 55±1 % RH). The cubic samples of product, with edges of 2.00±0.2 cm were placed in the compression support plate. Such cubic samples were compressed up to 50.0 % of their initial size. Five cubic samples were used for each experimental SCY under study and the average of these readings was reported. The textural characteristics of fermented product samples were directly displayed on the monitor of the computer as graph [Load (N) vs. time (s)] as well as derived values in tabular form. The hardness, cohesiveness and adhesiveness values were directly taken from the displayed readings.

Sensory evaluation of sweetened concentrated yogurt: On the basis of desirable attributes of *dahi*, the 100 point score card suggested by Ranganadham & Gupta [16] was used for scoring SCY. The sensory evaluation of product was carried out by ten judges, selected on the basis of triangle and Duo-trio tests. All the judges were well aware about the desirable characteristics of product. SCY samples, initially kept in the refrigerator, were presented to the judges, after tempering the product at 23±1ºC. Sensory evaluation of the fermented product was conducted in an isolated booth, illuminated with incandescent light and the room temperature was maintained at 23±1°C. The SCY samples were served in 100 ml polystyrene cups. All the samples were coded and the order of serving the samples was completely randomized.

Statistical analysis

The mean value of each attribute under study obtained from duplicate samples of five replications (three treatments) were subjected to statistical analysis using 'Completely Randomized Design' with equal number of observations [17].

Results and Discussion

The composition of mango pulp and partly skimmed sweetened condensed milk is shown in Table 2.

Table 2: Analyses for canned mango pulp, *chakka* and partly skimmed sweetened condensed milk.

Parameters	Sweetened Condensed Milk	*Chakka*	Parameters	Mango pulp
Fat	3.90%	12.5%	Colour of pulp	Orange
Protein	8.20%	6.5%	TSS	24.00%
Total Carbohydrates*	56.50%	6.4%	TS	26.15%
Ash	1.95%	0.9%	pH	3.80
Total Solids	70.55%	26.3%	Acidity (% citric acid)	0.65
Acidity (%LA)	-	1.75%		

*carbohydrate was obtained by difference; LA: Lactic Acid

Process standardization for the manufacture of sweetened concentrated yogurt

SCY (*Bhapa dahi*) was prepared adopting the process standardized by Bhattacharya et al. [1] with some modification; modification involved use of SCM in place of plain condensed milk. The effect of admixing *chakka* with SCM in three proportions viz., 40:60, 45:55 and 50:50 w/w on the product quality was studied. The rate of addition of mango pulp (24.0 % TSS, 3.8 pH, 0.65% citric acid) was kept constant at 18.0 % by weight of base mix (*chakka*+SCM). This level of mango pulp was decided based on preliminary trials taken in which 16.0, 18.0 and 20.0 % level of mango pulp was evaluated. Towards the end of manufacturing process, the steaming period required to attain the firm, set product was studied (i.e. 15, 18 and 21 min). Since SCM had 43.0 % sugar (sucrose) and mango pulp too contributed to the overall sweetness, there was no need to add additional sugar to the *chakka*+SCM blend.

The process standardization involved three phases viz.,

(i) Selecting the best starter culture from amongst three thermophilic yogurt cultures,

(ii) Selecting the best proportion of *chakka* and SCM which formed the base mix, out of 40:60, 45:55 and 50:50 w/w (*chakka*: SCM), and

(iii) Deciding the cooking (steaming) period which gave best gelled structure and sensory flavor out of 15, 18 and 21 min.

Screening of thermophilic starter cultures

The experiment involved preparing three batches of SCY using three thermophilic starter cultures viz. Yo-Flex, Sacco-1(Y-470F) and Sacco-2 (Y-170F) (all Direct to Vat Starters - DVS) to find out which culture yielded resultant fermented product having the best sensory quality. The DVS cultures were used @ 0.15 g per l. of milk. The rate of addition of mango pulp was kept constant at 18.0 % level. Each treatment was replicated five times.

Physico-chemical properties of concentrated yogurt as affected by starter cultures

The average values of physico-chemical properties of SCY are presented in Table 3. Food Safety and Standards Act (FSSA) has promulgated legal standards for *Dahi* (yogurt like product popular

in India) and Yoghurt in India. However, there are no standard laid down by FSSA for *Bhapa dahi* in India [18]. However, in this paper, an attempt has been made to compare the composition of *Bhapa dahi* with the standards laid down by FSSA for *Shrikhand* (a high TS fermented milk product made using *chakka*, sugar, flavouring with or without colour). Since, there was some variation in the moisture content of SCY, the protein content of resultant product was also expressed as protein at constant moisture (PCM).

Table 3: Physico-chemical properties of concentrated yogurt as affected by starter cultures.

Constituents[#]	Concentrated yogurt[*] made using Starter Cultures			CD(0.05)
	Yo-Flex	Y-480F	Y-170F	
Moisture	52.36	53.30	52.49	NS
Fat	7.28	7.18	7.24	NS
FDM[1]	15.27	15.37	15.25	NS
Protein	7.77	7.73	7.75	NS
Protein (52% Moisture)	7.83	7.95	7.83	NS
Carbohydrate[2]	31.62	30.81	31.54	NS
Ash	0.97	0.98	0.98	NS
Acidity (% LA)	0.94	0.90	1.05	0.04
pH	5.37	5.50	5.25	0.03

[1]Fat-on-dry matter; [2]Total carbohydrate was obtained by difference; *made using *chakka* + SCM (1:1, w/w); #all the values are in per cent, except for pH; LA: Lactic acid

The fermented milk products closely related to '*Bhapa dahi*' are concentrated yoghurt (*Labneh*) (~10.0 % fat, 26.0 % TS), *Mishtidahi* (~10.0 % fat, 16.0-20.0 % sugar, 41.80 % TS), etc [19,20]. The ash content of SCY samples was greater than the maximum limit specified by FSSA for *Shrikhand*; rest of the compositional parameters (i.e. fat on dry matter (FDM)), protein on dry matter, acidity (as % lactic acid) conformed to the FSSA requirements for *Shrikhand*. As expected, none of the physico-chemical properties of SCY were significantly affected by the type of starter cultures used, except for acidity and pH. The acidity of product was highest for SCY made using Y-170F culture, which differed significantly ($P < 0.05$) from the acidity of other two samples; the acidity of SCY made using Yo-Flex and Y-480F were at par with each other (Table 3). In case of pH, SCY made using Y-170F had the least pH which differed significantly ($P < 0.05$) from the pH of other two products. The pH of CSY made using Yo-Flex and Y-480F cultures also differed significantly ($P < 0.05$) from each other; the former product had significantly lower pH.

The ability of different starter culture strains in producing fermented milk products having different acidity/pH is well known; even the flavour profile of the resultant product is affected [21].

Influence of starter cultures on the sensory score of sweetened concentrated yogurt

The average values of colour and appearance, flavour, body & texture, acidity and total sensory score as reported by the judges are presented in Table 4.

Flavour: The flavour of *Bhapa dahi* should ideally be pleasant with a caramel note [1]. CSY is associated with rich flavour of fat and is acidic in taste [22]. The flavour of yoghurt is determined by a unique combination of volatile organic compounds like acetaldehyde, diacetyl and other flavour compounds; acetaldehyde is the prominent flavour compound. These compounds are mainly formed during the first couple of hours during fermentation process. Yoghurt is acidic in nature. Since CSY was prepared using similar thermophilic cultures, the flavour of product would be due to the flavouring constituents of yoghurt. All the three CSY samples had a pleasant, sweet-sour taste, with subtle flavour of mango. The flavour score of CSY made using Yo-Flex and Y-170F cultures was significantly ($P < 0.05$) greater than the score associated with product made using Y-480F culture; the former two samples had flavour score that was at par with each other (Table 4). The difference in the flavour score of experimental CSY samples could be attributed to the production of varied flavouring components as a result of their metabolic activity. Each strain of starter culture influences the flavor characteristics of yogurt/*dahi* [23]. Even the tartness of the three CSY samples was slightly different; the product having higher acidity was preferred by the judges, possibly because the sugar-acid blend in such product was properly balanced.

Using commercial blends of probiotic (*Bifidobacterium, Lactobacillus, Enterococcus and Pediococcus*) and yoghurt starter (*Streptococcus thermophilus* and *Lactobacillus delbruekii* sub sp. *bulgaricus*) in the preparation of probiotic fermented milk and yoghurt yielded product having distinctly varying flavour (mainly

based on acid taste) attributes. Each starter culture has its own intrinsic ability to produce acids as a result of fermentation. Acetic acid production by the starter cultures had the greatest influence on the flavour attribute of fermented product [24]. Courtin & Rul [25] reported that the association of *Streptococcus thermophilus* and *Lactobacillus delbruekii* subsp. *bulgaricus* in yoghurt manufacture affected the production of volatile molecules involved in flavour development.

Table 4: Influence of starter cultures on the sensory score of concentrated yogurts.

Sensory Scores	Concentrated yoghurt* made using starter cultures			CD(0.05)
	Yo-Flex	Y-480F	Y-170F	
Flavour (45)	40.93±0.06	39.86±0.11	40.86±0.34	0.29
Body and Texture (30)	25.64±0.51	24.86±0.11	26.79±0.62	0.64
Colour and Appearance (10)	8.75±0.14	8.21±0.17	8.93±0.17	0.22
Acidity (10)	8.21±0.17	8.21±0.06	8.64±0.06	0.15
Package (05)#	5.00	5.00	5.00	-
Total Score (100)	88.54±0.88	86.14±0.45	90.21±1.19	1.23

Figures in parentheses indicates maximum scores; *made using *chakka* + SCM (1:1,w/w); #: Full score was given to package.

Body and texture: *Bhapa dahi* should have soft to firm body and smooth texture without cracks or holes, possessing semi-solid consistency. It should be sliceable enough and during slicing, there should be no exudation of whey. In case of Set-style fermented milk product, optimal firmness and reduced syneresis are highly desirable characteristics for its successful marketing [26]. The body and texture score is given based on the overall perception of sample's firmness (force required to compress), adhesiveness (extent of stickiness of sample to the tongue and palate after compression), thickness (consistency of sample after initial compression between tongue and palate) and dissolvability (ease with which the sample dissolves in mouth) [27,28]. The body and texture score of all the three CSY samples were significantly different from each other. Product made using Y-480F culture had the least body-texture score, since such product was somewhat grainy, loose and had a moist body. The CSY made using Y-170F had a soft body and uniform, homogenous texture, whereas Yo-Flex product was associated with slight crumbly body. Hence, CSY made using Y-170F was assigned significantly higher ($P < 0.05$) body-texture score than either of products made using Yo-Flex and Y-480Fcultures (Table 4). Use of different thermophilic cultures is bound to produce CSY having varying body and texture quality. The rate of acid production, the final acidity value of the fermented product upon cooling, etc. has a bearing on the body and texture of the resultant fermented product [29].

Colour and appearance: The colour of any food product is an important attribute, which is responsible for enticing the consumer to buy and consume the product. The colour of CSY should be pleasing, attractive and uniform without showing any sign of visible foreign matters. Plain *Bhapa dahi*(without flavouring) should be bright and white in colour. Mango flavoured *Bhapa dahi* should possess uniform yellowish orange colour. It should exhibit a firm gel structure with no signs of whey separation. The colour score of CSY samples made using Yo-Flex and Y-170F cultures were significantly ($P < 0.05$) greater than the score assigned to Y-480F sample; the former two products had identical colour score. In case of product made using Y-480F culture, syneresis was observed. Moreover, such product sample exhibited tiny air holes. Both these parameters decreased the product's appearance appeal. Such effect was probably due to loose body. CSY samples prepared utilizing Y-170F and Yo-Flex cultures had uniform and homogeneous body.

Acidity score

The *Bhapa dahi* should possess moderate acidity, excess sourness is not desirable. The acidity score of Y-170F CSY was significantly ($P < 0.05$) greater than that associated with samples made using Y-480F and Yo-Flex cultures. Culture Y-170F tended to produce product having higher lactic acid content compared to other two cultures (Table 3). It is a well-known fact that use of different starter strains (all of them thermophilic) tend to produce fermented dairy product having varying acidity; even change in the proportion of component starters (i.e. *S. thermophilus* and *Lactobacillus delbruekii* sub sp. *bulgaricus*) can affect the final acidity of the fermented product [30].

Total sensory score

Sweetened concentrated yogurt made using Y-170F culture had the highest sensory score for flavour, body and texture, colour and appearance, as well as acidity. This made such sample having the highest total sensory score, which differed significantly ($P < 0.05$) from the scores of other two fermented products (Table 4). Of the latter two samples, the one made using Yo-Flex culture had superior score.

Hence, based on the sensory characteristics of CSY, it is recommended to utilize Y-170F culture (@ 0.15 g per l. of milk) to prepare curd for further conversion into steamed concentrated yogurt. This specific DVS culture tended to yield fermented product having highest acidity, with pleasing fermented flavor; upon blending of SCM to it and subjecting the base mix to steaming the resultant product had highly pleasing taste and flavor.

Selecting the proportion of *chakka* and SCM in the formulation of sweetened concentrated yogurt

Bhattacharya et al. (1979) prepared *Bhapa dahi* by subjecting the blend of *chakka*(8.5-9.3 % fat, 27.85-33.20 % TS, 1.15-1.45 % LA), concentrated milk (26.0 % TS) (*chakka*: condensed milk, 70:30 w/w) and sugar (@ 15.0% by weight) to steaming process. The present investigation involved preparing three batches of *Bhapa dahi* using varying proportions of '*chakka*' and SCM viz., 40:60, 45:55 and 50:50 (*chakka*:SCM, w/w). Each treatment was replicated five times. Canned mango pulp was used as flavouring at 18.0% level.

Physico-chemical properties of sweetened concentrated yogurt as affected by the proportion of base materials

Varying the proportion of *chakka* and SCM had a significant effect on all of the physico-chemical characteristics of resultant product (Table 5). As the proportion of *chakka* increased in the base mix, the moisture content of product tended to increase; the effect was found to be significant ($P < 0.05$) when each product was compared with each other. This was expected since *chakka* had higher moisture (73.70 %) content compared to SCM (29.45 %). The fat and FDM content of CSY were significantly ($P < 0.05$) affected; there was a linear increase in fat and FDM as the proportion of *chakka* increased in the base mix. The reason for such an increase was due to the greater fat content of *chakka* (i.e. 12.5 %) compared to that of partially skimmed SCM (i.e. 3.9 %) (Table 2).

The only significant difference ($P < 0.05$) with regard to protein at constant moisture (PCM) was observed for CSY prepared using 40:60 and 50:50 proportion of *chakka* and SCM. However, the values of PCM was at par with each other for products made using 40:60 and 45:55 proportion as well as for products made using 45:55 and 50:50 proportion. Such change in the values of PCM was owing to the difference in the protein content of the base materials; *chakka* and SCM had 6.5 % and 8.20 % protein content respectively (Table 2). The carbohydrate content of CSY also differed significantly ($P < 0.05$) from each other; maximum carbohydrate content was associated with product made using 40:60 proportion, possibly because of least moisture content associated with such product (Table 5). The ash content of CSY differed significantly ($P < 0.05$) from each other since *chakka* had lower ash content than SCM (Table 2); highest ash content was associated with CSY sample made using 40:60 proportion. The acidity of product tended to increase significantly ($P < 0.05$) as the proportion of *chakka* in the base mix increased (Table 5). The increasing acidity of CSY containing higher proportion of *chakka* is obvious since the contribution of acidic constituent (lactic acid and other acidic components) increased while the protein content decreased. Proteins (casein, albumin) do contribute to the natural acidity of milk and milk products [30]. Since pH and acidity have inverse relationship, the pH of the product tended to decrease as the proportion of *chakka* in the base mix increased; the effect was significant ($P < 0.05$) at each level of *chakka* incorporation.

When comparing the composition of CSY with 'fruit *Shrikhand*', the product complied with the FSSA requirements in terms of FDM, protein on dry matter as well as for titratable acidity [18].

Table 5: Physico-chemical properties of concentrated yogurt made using varying proportion of *chakka* and sweetened condensed milk.

Constituents*	Concentrated yoghurt# made using proportion of *chakka* and SCM (w/w)			CD(0.05)
	40:60	45:55	50:50	
Moisture	49.05±0.59	50.73±0.50	52.27±0.49	0.73
Fat	6.33±0.05	6.77±0.03	7.19±0.06	0.06
FDM[1]	12.42±0.10	13.74±0.19	15.06±0.23	0.25
Protein	8.63±0.07	8.26±0.04	7.85±0.06	0.09
Protein (52% Moisture)	8.30±0.16	8.22±0.12	8.06±0.11	0.18
Carbohydrate[2]	34.88±0.61	33.17±0.54	31.66±0.51	0.76
Ash	1.11±0.01	1.07±0.01	1.03±0.02	0.02
Acidity (% LA)	0.91±0.01	0.96±0.01	1.05±0.01	0.01
pH	5.46±0.03	5.31±0.01	5.21±0.02	0.03

[1]Fat-on-dry matter; [2]Total carbohydrate was obtained by difference; SCM: Sweetened Condensed Milk; *all the values are in per cent, except for pH; LA: Lactic acid

Texture profile of concentrated yogurt as affected by the proportion of base materials

Food rheology is the study of the deformation and flow of food materials [31,32]. *Bhapa dahi*, which is similar to Set yoghurt in consistency is a viscoelastic solid. The force necessary to attain a given deformation, referred to as hardness, is commonly evaluated while determining the texture of set-type cultured dairy products [28]. A negative correlation has been observed between the hardness of yoghurt/*dahi* and syneresis. The syneresis of product

is also related to its TS content and the degree of processing treatment meted to milk in its preparation; the syneresis of product tended to reduce as the TS of yoghurt increased [26,33]. Cohesiveness is the ratio of the positive force area under the first and second compressions and is indicative of how easily a food sample would deform. Adhesiveness is the negative force of the first bite representing the work necessary to pull the compressing plunger away from the sample [28].

CSY has such a characteristic gelled consistency (owing to high TS, denaturation of protein and hydration of denatured proteins) that it can be cut (portioned) into desired portion size for serving. Hence, the body and texture property of CSY is an important factor deciding its functionality for usage and storage stability (free from syneresis).

Varying the proportion of *chakka* and SCM in the base mix had a significant ($P < 0.05$) influence on hardness and adhesiveness of product, cohesiveness remained unaffected (Table 6). The CSY made using *chakka*:SCM (40:60) had maximum firmness, which differed significantly ($P < 0.05$) from the hardness values of other two samples; the latter two samples were at par with each other. CSY made using *chakka*:SCM (45:55) had the highest adhesiveness value, which differed significantly ($P < 0.05$) from the values associated with other two samples; the latter two samples were rated at par with each other (Table 6).

Since CSY made using *chakka*:SCM (40:60) had the least moisture and maximum protein and ash content (Table 2), it led to product having maximum firmness. Yoghurt or *Dahi* with higher protein and ash content is reported to be firmer than the one having lower protein and ash content [33]. There is no reported literature on adhesiveness of concentrated yogurt or similar fermented products, hence comparison could not be made.

Table 6: Influence of varying proportion of *chakka* and sweetened condensed milk on the texture profile of concentrated yogurt.

Textural Parameters	Concentrated yoghurt* made using proportion of *chakka* and SCM (w/w)			CD(0.05)
	40:60	45:55	50:50	
Hardness (N)	2.73	2.50	2.57	0.08
Cohesiveness	0.115	0.110	0.125	NS
Adhesiveness (N-mm)	0.52	0.60	0.53	0.05

SCM: Sweetened condensed milk; N: Newton; mm: millimeter

Influence of varying the proportion of chakka and SCM on the sensory characteristics of sweetened concentrated yogurt

The data furnished in Table 7 indicates that use of varying proportions of *chakka* and SCM had a profound influence on the flavour and total sensory score of the resultant CSY. The description of each sensory attribute is given below.

Flavour

The flavour score of product made using *chakka*:SCM (50:50) was significantly ($P< 0.05$) greater than the scores associated with products made using 40:60 and 45:55 proportions; the latter two products were rated at par with each other (Table 7). All the three CSY had a pleasant, sweet-acidic taste, however the subtle balance between sweetness and acidity was found to be superior in case of product prepared using 50:50 proportion. The product made utilizing *chakka*:SCM (40:60) was perceived to be more sweeter, which tended to subdue the acidic taste to some extent. Such effect was owing to the higher proportion of SCM (thus higher contribution of sugar) in such base mix. In general, it was observed that use of greater proportion of *chakka* in the base mix led to CSY having superior flavour. For any sweetened fermented product (i.e. *Misti dahi*, Stirred yoghurt, etc.), the subtle balance between sweetness and acidity is important for the product's flavor impact [28].

Table 7: Influence of varying proportion of *chakka* and SCM on the sensory score of concentrated yogurt.

Sensory Scores	Concentrated yoghurt*made using proportion of *chakka* and SCM (w/w)			CD(0.05)
	40:60	45:55	50:50	
Flavour (45)	40.15	40.61	41.41	0.68
Body and Texture (30)	26.40	25.59	26.55	NS
Colour and Appearance (10)	8.62	8.59	8.62	NS
Acidity (10)	8.10	8.30	8.35	NS
Package (05)#	5.00	5.00	5.00	-
Total score (100)	88.27	88.09	89.93	1.48

SCM: Sweetened condensed milk; Figures in parentheses indicates maximum scores; **# -** Full score was given to package.

Body and texture, color and appearance and acidity score

The CSY made using the three proportions of *chakka* and SCM had identical body and texture, color and appearance as well as acidity scores (Table 6). This means that varying the proportion of *chakka* and SCM did not appreciably affect the sensory aspects with regard to color, body and texture and acidity.

Total sensory score

Since CSY made using *chakka*:SCM (50:50) had the highest score for flavour, body and texture, colour and appearance, and acidity, it obviously had the highest total sensory score. The total sensory score associated with such product (i.e. 1:1) differed significantly ($P < 0.05$) from the scores of other two CSYs. The total score of products made using 45:55 and 40:60 proportion of *chakka* and SCM, however, were at par with each other (Table 6). According to Bhattacharya et al. [1] *Bhapa dahi* prepared from concentrated (volume concentration ratio of 2:1) milk and *chakka* (7:3, w/w) led to a product having 7.06 to 8.76 % milk fat. Such product was rated more acceptable than the product containing lower (i.e. 5.87 %) milk fat. Based on the above findings, it is evident that *Bhapa dahi* made using *chakka* and SCM in 1:1 proportion yielded a product having highest sensory score and hence such proportion of *chakka* and SCM, which formed the base mix, was utilized in the next phase of experimentation.

Process standardization for the manufacture of sweetened and flavoured concentrated yogurt

In the preparation *Bhapa dahi*, the base mix comprising of *chakka* and other milk solids is subjected to steam cooking in order to obtain the desired body and texture (firm, set curd). Such cooking (steaming) parameter has a profound effect on the body and texture (i.e. gelled consistency) as well as flavour of the resultant product. Hence, it was decided to optimize the processing aspect (i.e. steaming period required to attain desired gel structure) for the preparation of CSY. Since the ingredients used by Bhattacharya et al. [1] were different (i.e. *chakka*, plain condensed milk and sugar) than the ones employed in the present investigation (*chakka*, SCM and mango pulp), the steaming period requirement was different in both cases. Bhattacharya et al. [1] had studied varying cooking period ranging from 10 - 25 min and recommended an optimum steaming period of 10 min. Based on the result of preliminary trials, the present investigation involved steaming period of 15, 18 and 21 min. The experiment involved preparing three batches of CSY keeping three steaming period. Each treatment was replicated five times. Alphonso mango pulp was used at a constant level of 18.0 % by weight of base mix (i.e. *chakka*:SCM, 1:1 w/w). The photographs of the *Bhapa dahi* made in bulk, using varying steaming period are shown in Figures 2A, 2B & 2C.

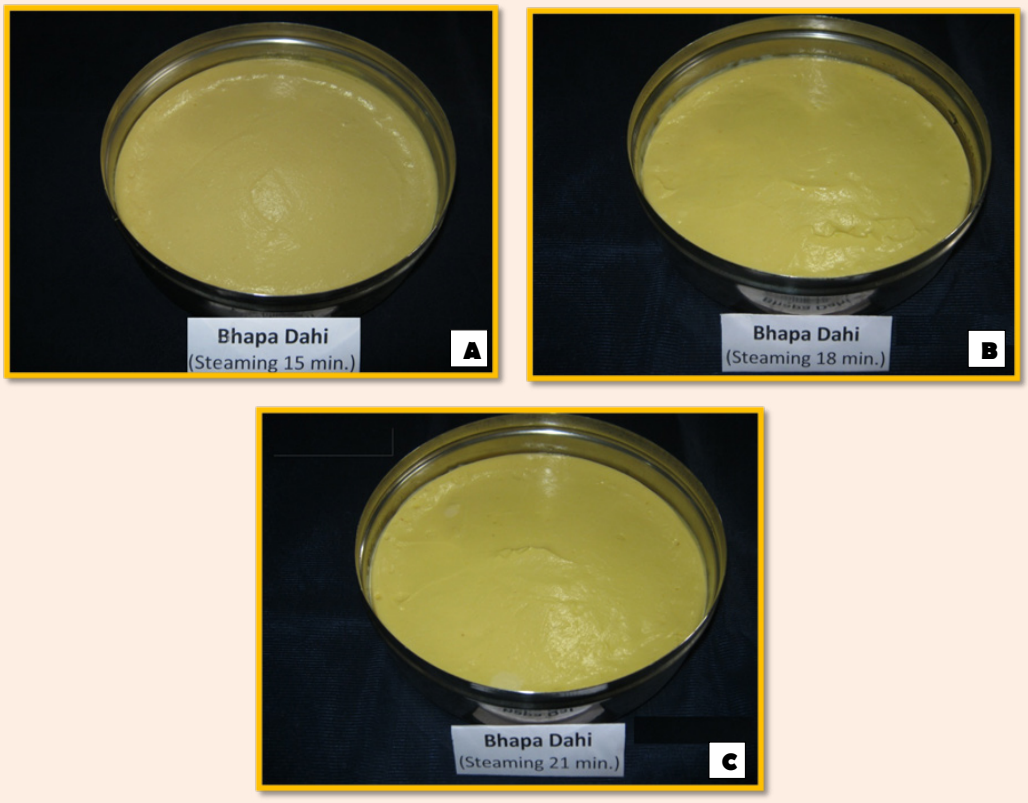

Figure 2: *Bhapa dahi* obtained using steaming period of (A) 15 min, (B) 18 min, (C) 21 min.

Physico-chemical properties of SCY as affected by the steaming treatment

Except for carbohydrate content, all other physico-chemical parameters of CSY were significantly affected by the steaming period used in its preparation (Table 8). The moisture content of all the three CSY samples were significantly ($P < 0.05$) different from each other. As the steaming period increased from 15 to 21 min, the moisture content of CSY tended to decrease. The reason for the decrease in moisture content of CSY with increasing steaming period is obvious; more evaporation of moisture took place as the steaming period was increased. The difference in the moisture content of CSYs, in turn, affected the other chemical constituents too (viz. FDM, PCM, ash, acidity and pH). The FDM and PCM of all the CSY samples were significantly ($P< 0.05$) different from each other. The ash content of CSY made using 18 and 21 min. of steaming period were rated at par with each other (Table 8). The ash content of CSY made employing 15 min steaming time was significantly ($P<0.05$) lower than the values of ash associated with other two samples. The CSY made using 15 min steaming time had acidity value that was significantly ($P<0.05$) lower than the acidity of product made using 21 min. steaming; other two samples had acidity values that were at par with each other. In similar lines, the CSY made using 15 min. steaming period had the maximum pH. The increased acidity of CSY samples prepared employing higher steaming period maybe due to increase in the acidic constituents as a result of increased evaporation of moisture from the product. Such pH differed significantly ($P < 0.05$) from the pH values of other two fermented product samples; the latter two samples (steaming period of 18 and 21 min) had similar pH values. The inverse relation between acidity and pH of fermented dairy product is well known [33]. According to Bhattacharya et al. [1], the *Bhapa dahi* prepared using plain condensed milk and *chakka* (70:30, w/w) had 7.06 % fat, 38.02 % TS and 0.54 % acidity (as LA), when steaming period was standardized at 10 min.

Table 8: Physico-chemical properties of concentrated yogurt as affected by the steaming period.

Constituents*	Concentrated yoghurt# made using steaming period (min.)			CD(0.05)
	15	18	21	
Moisture	52.64±0.22	52.20±0.22	51.71±0.21	0.30
Fat	7.23±0.02	7.40±0.02	7.83±0.02	0.03
FDM[1]	15.27±0.08	15.48±0.12	16.22±0.08	0.13
Protein	7.59±0.01	7.81±0.02	8.08±.0.10	0.08
Protein (52% moisture)	7.70±0.05	7.84±0.04	8.03±0.12	0.11
Carbohydrate[2]	31.54±0.23	31.55±0.25	31.33±0.28	NS
Ash	1.00±0.01	1.04±0.00	1.05±0.01	0.01
Acidity (% LA)	0.99±0.02	1.01±0.02	1.03±0.02	0.03
pH	5.23±0.01	5.20±0.01	5.19±0.01	0.01

[1]Fat-on-dry matter; [2]Total carbohydrate was obtained by difference, *all the values are in per cent, except for pH; #made using *chakka*+SCM (1:1,w/w); LA: Lactic acid

Influence of steaming period on the textural characteristics of sweetened and flavoured concentrated yogurt

Except for cohesiveness, the steaming period had a significant influence on all other textural parameters of CSY (Table 9). The hardness of product prepared using 21 min. steaming period was maximum; such value was significantly ($P < 0.05$) greater than the values associated with other two CSY samples; the latter two samples were at par with each other. The adhesiveness of CSY made using 18 min. steaming period was maximum; such value was significantly ($P < 0.05$) different from the values associated with other two samples. The latter two samples (15 and 21 min of steaming) had identical adhesiveness values. The reason for the maximum firmness associated with CSY made using 21 min. steaming period (vs. 15 or 18 min), was probably due to the least moisture and highest protein and ash content in the former product (Table 8). Bhattacharya et al. [1] reported that as the steaming time was increased from 10 to 25 min, the *Bhapa dahi* became harder, crumblier and exhibited greater tendency towards whey separation.

Effect of steaming period on the sensory characteristics of sweetened and flavoured concentrated yogurt

The data furnished in Table 10 indicates that steaming period employed in the preparation of CSY had a marked influence on the flavour, body and texture, and total sensory score of the resultant product. The photograph of portion sized samples of *Bhapa dahi* is shown in Figures 3A, 3B & 3C. The detailed description of each sensory attribute is as given below.

Flavour

The flavour score of CSY made using 15 min. steaming period was maximum. Such superior score differed significantly ($P < 0.05$) from the scores associated with samples prepared using 18 and 21 min. of steaming; the flavour score of the latter two

samples were at par with each other (Table 10). The reason for the superior flavour score of CSY made using 15 min. steaming time could be due to the relatively softer curd structure produced (as less amount of water got evaporated), which led to superior perceived flavour impact. In case of CSY samples made using increased steaming time (i.e. 18, 21 min), the desired flavour notes of product were subdued. The association of milk constituents in the gelled fermented product, which in turn affects the product's consistency, has a bearing on its flavor perception [23]. Bhattacharya et al. [1] reported that *Bhapa dahi* made using steaming time of 10 to 25 min. had good flavor profile, however, the one made using 10 min. had a more pleasing taste.

Table 9: Influence of steaming period on the texture profile of concentrated yogurt.

Textural Parameters	Concentrated yoghurt* made using steaming period (min.)			CD(0.05)
	15	18	21	
Hardness (N)	2.71±0.09	2.83±0.03	3.24±0.31	0.26
Cohesiveness	0.128±0.003	0.122±0.002	0.130±0.02	NS
Adhesiveness (N-mm)	0.49±0.04	0.56±0.05	0.49±0.02	0.05

*-made using *chakka*+SCM (1:1, w/w)

Table 10: Influence of steaming period on the sensory score of concentrated yogurt.

Sensory Score	Concentrated yoghurt* made using steaming period (min)			CD(0.05)
	15	18	21	
Flavour (45)	42.38±1.29	40.91±0.20	40.78±0.27	1.06
Body and Texture (30)	27.64±0.76	28.20±0.15	26.30±0.17	0.63
Colour and Appearance (10)	8.63±0.14	8.53±0.15	8.50±0.13	NS
Acidity (10)	8.20±0.04	8.04±0.11	8.07±0.14	NS
Package# (05)	5	5	5	-
Total score (100)	91.85±2.05	90.68±0.35	88.65±0.17	1.33

Figures in parentheses indicates maximum score, # - Full score was given to package

Body and texture

The body and texture score of CSY made using 15 and 18 min. steaming period was significantly ($P < 0.05$) greater than the score allotted to product made using 21 min. steaming; the former two products had similar body and texture score (Table 10). The product made employing 21 min. of steaming was criticized for being dry and quite firm. Likewise, adverse impact on the body and texture of *Bhapa dahi* has been noted when adopting higher steaming period (25 vs. 10 min.) [1]. They reported that 10 min. of steaming period resulted in product having soft and smooth body, while steaming for 20-25 min. resulted in product having hard body and crumbly texture.

Colour & appearance and acidity scores

All the three CSY samples made using different steaming period had colour and appearance as well as acidity scores that were at par with each other (Table 10). However, there was slight whey separation upon cutting of the CSY samples into smaller individual pieces.

Total sensory score

The total sensory score of CSY was similar (at par) for samples steamed for 15 and 18 min. However, such score was significantly ($P < 0.05$) greater than the total score associated with product made using 21 min. steaming. This is obvious since the CSY prepared using 21 min. of steaming period had the least score for colour and appearance, flavour as well as body and texture (Table 10).

Bhattacharya et al. [1] reported that use of 10 min. steaming period resulted in a firm, smooth gel-like product with a pleasant flavour. Steaming period of 15 min. led to product having good flavour, slightly hard body but smooth texture and exhibited whey separation on cutting. As the steaming time was further increased (i.e. 25 min), the product still had good flavour, but it was hard and crumbly and exhibited whey separation on the surface. Based on the above findings, it is concluded that steaming period of 15 min. in the preparation of CSY *(Bhapa dahi*) utilizing base mix as *chakka*:SCM of 1:1 w/w and mango pulp @ 18% by weight, yielded sensorily highly acceptable product; increasing the steaming period above that period had some adverse effect on both flavour as well as body-texture qualities.

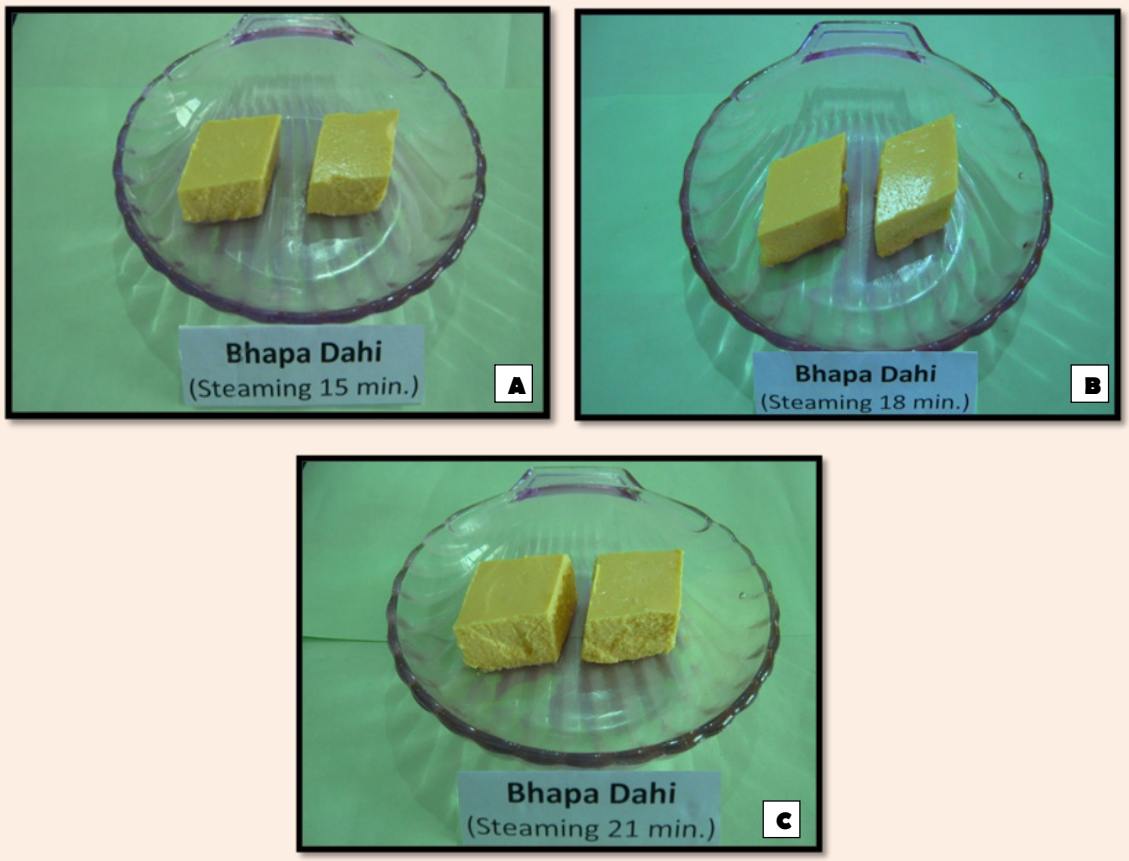

Figure 3: *Bhapa dahi* (portion sized) made using steaming period of (A) 15 min, (B) 18 min, (C) 21 min.

Conclusion

Use of base mix comprising of *chakka* (12.5% fat, 26.3% TS) and SCM (3.9% fat, 70.55 % TS) in 1:1 proportion (w/w) helped in obtaining good quality sweetened concentrated yogurt; incorporation of Alphonso mango pulp @ 18% by weight enhanced its flavour, nutritional quality and possible improvement in therapeutic value. Use of Y-170F thermophilic culture at the rate of 0.15 g/l of milk is recommended for the preparation of *chakka*. A steaming period of 15 min. is recommended as the processing parameter to obtain highly acceptable *Bhapa dahi* possessing the desired gelled structure.

Acknowledgement

The authors would like to gratefully acknowledge the free samples of Sacco starter cultures provided by Shri Ashish Acharya, Technical Manager (SE-Asia), Saccosrl for the present investigation.

References

1. Bhattacharya DC, Tiwari BD, Des Raj, Srinivasan MR (1979) A technique for the production of *Bhapadahi*. Indian J Dairy Sci 32(2): 168-172.
2. Bhattacharya DC, Des Raj, Tiwari BD (1980) A modified method for the preparation of *Bhapadahi*. Indian J Dairy Sci 33(1): 38-42.
3. Rao NBS, Deosthale YG, Pant KC (2009) Nutritive Values of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India, p. 45-58.
4. Kumar P, Mishra HN (2004) Mango fortified set yoghurt: effect of stabilizer addition on physico-chemical, sensory and textural properties. Food Chem 87(4): 501-507.
5. Desai SR, Toro VA, Joshi SV (1994) Utilization of different fruit in the manufacture of yogurt. Indian J Dairy Sci 47(10): 870-874.
6. BIS (1977) Determination of fat by Gerber method. IS: 1224. Part I. Bureau of Indian Standards, Manak Bhavan, New Delhi, India, p. 1-14.
7. Boghra VR (1997) Chemical analysis of milk. Laboratory Quality Assurance in Dairy Industry. SMC College of Dairy Science, Anand, Gujarat, India, pp. B24-B30.
8. BIS (1961) Methods of test for dairy industry. IS: 1479 (Part II). Chemical analysis of milk. Bureau of Indian Standards, Manak Bhavan, New Delhi, India, p. 1-57.
9. BIS (1980) Specification for *chakka* and *shrikhand*. IS: 9532. Bureau of Indian Standard, Manak Bhavan, New Delhi. India, p. 1-14.
10. Milk Industry Foundation (1959) Laboratory Manual. Methods of analysis of milk and its products, (3rd edn), Washington, USA, p. 283.
11. BIS (1973) Specification for condensed milk. IS: 1166. Bureau of Indian Standard, Manak Bhavan, New Delhi, India, p. 1-23.

12. Puntambekar PM (1968) Studies on levels of fat and sugar on the quality of *shrikhand* and estimation of fat by modifying the Gerber test for milk. M.Sc. thesis submitted to Sardar Patel University, Vallabh Vidyanagar, Gujarat, India.

13. Mann B, Lal D, Ram M (2010) Acidity. Chemical Analysis of Food and Food Products (1st edn), Chapter 9. Intech Printers and Publishers, Karnal, Haryana, India, p. 79-84.

14. Jayaraman J (1981) Laboratory Manual in Biochemistry, Wiley Eastern Ltd., New Delhi, India, p. 75.

15. BIS (1989) BIS Handbook of Food Analysis. SP: 18 (Part XI – Dairy Products).Bureau of Indian Standards, Manak Bhavan, New Delhi.

16. Ranganadham M, Gupta SK (1987) Sensory evaluation of *dahi* and yoghurt. Indian Dairyman 39(10): 493-497.

17. Steel RGD, Torrie JH (1980) Analysis of Variance. I: The one-way classification. Principles and Procedure of Statistics - A Biometrical Approach, Chapter 7, (2nd edn.), Mc Graw Hill Kogakusha Ltd., Japan, pp. 137-167.

18. FSSA (2011) The Food Safety and Standards Act, 2006. Professional Book Publishers, New Delhi, India, pp. 292-293, 315.

19. Tamime AY, Robinson RK (1999) Yoghurt: Science and Technology. (2nd edn), CRC Press, Boca Raton, FL, USA.

20. Gupta RC, Mann B, Joshi VK, Prasad DN (2000) Microbiological, chemical and ultrastructural characteristics of *mishti doi* (sweetened *dahi*). J Food Sci Technol 37(1): 54-57.

21. Aswal P, Shukla A, Priyadarshi S (2012) Yoghurt: Preparation, characteristics and recent advancements. Cibtech J Bio-Protocols 1(2): 2319–3840.

22. Nsabimana C, Jiang B, Kossah R (2005) Manufacturing, properties and shelf life of *labneh*: a review. Int J Dairy Technol 58(3): 129-137.

23. Routray W, Mishra HN (2011) Scientific and technical aspects of yogurt aroma and taste: A review. Comp Rev Food Sci Food Safety 10(4): 208-220.

24. Torre LA, Tamime AY, Muir DD (2003) Rheology and sensory profiling of set perfermented milks made with different commercial probiotic and yoghurt starter cultures. Int J Dairy Technol 53(3): 163-170.

25. Courtin P, Rul F (2004) Interactions between micro-organisms in a simple ecosystem: yogurt bacteria as a study model. Lait 84(1-2): 125-134.

26. Lee WJ, Lucey JA (2010) Formation and physical properties of yogurt. Asain-Aust J Anim Sci 23(9): 1127-1136.

27. Raju PN, Pal D (2009) The physico-chemical, sensory and textural properties of *mistidahi* prepared from reduced fat buffalo milk. Food Bioprocess Technol 2(1): 101-108.

28. Raju PN, Pal D (2011) Effect of bulking agents on the quality of artificially sweetened *mistidahi* (caramel coloured sweetened yoghurt) prepared from reduced fat buffalo milk. LWT - Food Sci Technol 44(9): 1835-1843.

29. Chandan RC (2013) History and consumption trends. In: Chandan RC & Kilara A (Eds.), Manufacturing Yogurt and Fermented Milks, (2nd edn), Chapter 1. Blackwell Publishing, West Sussex, UK, p. 3-19.

30. Patel B (2013) Development of technology for the manufacture of probiotic *shrikhand*. M.Tech. Anand Agricultural University, Anand, Gujarat, India. p. 62.

31. De S (1983) Market milk. Outlines of Dairy Technology. (Chapter 1) Oxford University Press, Delhi, p.1-89.

32. Rao CV, Sanders ME, Indranie C, Simi B, Reddy BS (1999) Prevention of colonic preneoplastic lesions by the probiotic *Lactobacillus acidophilus* NCFM in F344 rats. Int J Oncol 14(5): 939-944.

33. Yeganehzad S, Mostafa MT, Fakhri S (2007) Studying microbial, physicochemical and sensory properties of directly concentrated probiotic yoghurt. Afr J Agri Res 2(8): 366-369.

Citation: Ronak P, Jana AH, Hiral M, Balakrishnan S (2016) Process Standardization for the Manufacture of Mango flavoured steamed Sweetened Concentrated Yoghurt (*Bhapa dahi*). J Dairy Vet Anim Res 4(3): 00119. DOI: 10.15406/jdvar.2016.04.00119