



RESEARCH ARTICLE

Probiotic flavored curd: Physicochemical and sensory attributes

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Abstract

Lactic acid bacteria are among the most important groups of microorganisms used in food fermentations. This research will focus on the monoculture flavored curd and sensory acceptance as we have found these are the most important challenges to ensure transferring the health benefits and the commercial success.

The objective of the study was to include probiotic lactic acid bacteria along with flavoured ingredients monocultured curd to enhance the organoleptic properties of plain curd to improve consumer acceptability and to identify methods for improving the nutrient profile and possible therapeutic effectiveness of plain probiotic curd. Physicochemical, microbiological and sensory attributes indicated that the use of Green chillies and Gobo root as a flavouring material in flavoured yoghurt preparation is highly recommended. Keeping in view all the above results, the production of flavored probiotic curd at commercial level is highly recommended.

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INTRODUCTION

Probiotics are live microbes that can be formulated into many different types of products, which are highly beneficial to human beings. Probiotics have been used for centuries in fermented dairy products. *Lactobacillus* and *Bifidobacterium* are most commonly used probiotics in food and dairy, Lactic acid bacteria (LAB) which have been used for food fermentation since the ancient time, can serve a dual function by acting as food fermenting agent and potentially health benefits provider (Fuller (1991), Ahmed (2003). de Vrese, *et al*, (2008). LAB are GRAS (general recognized as safe) with no pathogenic, or virulence properties reported. For the use of LAB as probiotics, in addition, some probiotics could produce antimicrobial substances like bacteriocins (Isolauri, *et al*, 2001). Therefore, the potential health benefit will depend on the characteristic profile of the probiotics. Kröckel (2006) had incorporated probiotic in to meat products and got good colour retention and texture. Probiotics have the ability to interact with the host micro flora and compete with microbial pathogens. Many survey shows that now even the efforts are going on to use the mixed cultures of bacterial species to produce specific flavor (Junaid, *et al*, 2013). Østlie, *et al* (2003). The agricultural applications of probiotics with regard to animal, fish, and plants production have increased gradually. However, a number of uncertainties concerning technological, microbiological, and regulatory aspects exist (Kröckel, 2006). Ahmed (2003) had reported that probiotics have many potential therapeutic uses, Lactic acid bacteria (LAB) have been modified by traditional and genetic engineering methods to produce new varieties, but only a few LAB have been modified by recombinant-DNA technology.

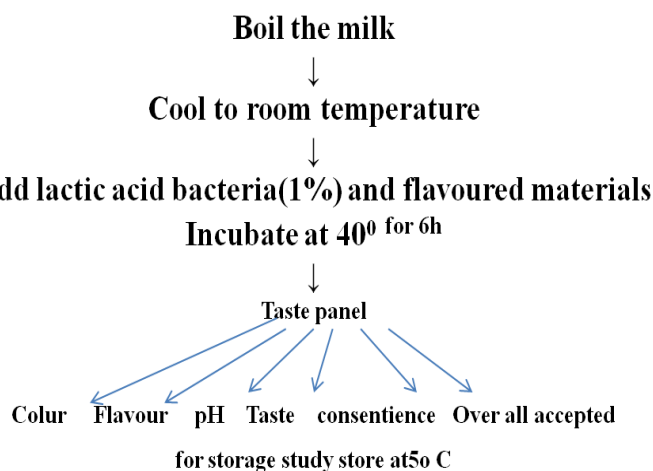
Materials and Methods:

Isolation of LAB from natural source: Lactic acid bacteria were isolated from milk and fermented product like curd.

Commercial samples, of milk collected from Mysore dairy. The samples were streaked on MRS agar plates and incubated under micro aerophilic condition at 40°C for 48 hrs. The individual colonies were isolated and transferred to MRS broth [Hi media, Mumbai, India] and incubated at 40°C for 24 hours and stored at 4°C. Milk was boiled and

cooled to room temperature before adding of culture. 1% culture was added to the milk along with flavoured materials (Table -1) and incubated at 40°C at 5°C for 4 hours.(Fig -1).

Fig -1, Flow chart for the preparation of flavoured curd.



Flavoured materials :Were procured from local market, Mysore(Table-1)

Table:1 Flavoured Materials used in the study:

No	Flavour products
1	Green chili
2	Mango ginger
3	Gobo-root (Flavored root)
4	Mint leaves
5	Pineapple

Physicochemical properties: pH, flavor, colour and consistence, consistency in terms of coagulation and texture were studied.

Table: 2.Preparation of the flavour curd and stored at two different temp.

	Temp		Temp	
	40° C	5° C	40° C	5° C
No	Mono cultured added curd		Dairy curd with flavoured products.	
1	Milk+ Culture+ Chilli		Dairy curd +Culture+ Chilli	
2	Milk+ Culture+Mnago ginger		Dairy curd +Culture+Mnago ginger	
3	Milk+ Culture +Gobo root		Dairy curd + Culture +Gobo root	
4	Milk+ Culture +Mint leaves		Dairy curd+ Culture +Mint leaves	
5	Milk+ Culture +Pineapple		Dairy curd+ Culture +Pineapple	

STORAGE STUDIES: Each batch of the treated and control samples were stored at two different temperatures i.e., 40°C and 5±1°C for varying periods, decided by the observation of visible spoilage (Table-2). Storage period for selected flavour curd is presented in results.

Sensory Evaluation: At the end of storage period when the physical characteristics were found ideal for consumption of green chilli and gobo root flavoured curd were assessed for their sensory attribute. Ten-trained panellists assessed the samples, using a 9-point Hedonic scale.

Results and Discussion:

The present investigation regarding the sensory profile of selected flavoured curd stored at low temperature revealed encouraging results. Green chilli and gobo root had positive influence since scores for sensory attributes were significantly higher for treated samples during the storage period. This new approach aimed at preserving both the freshness and nutritive values of fermented product have revolutionized the dairy processing technologies.

The primary barrier of microorganisms in the stomach is the gastric acidity (pH of 1.5-3.5). Besides the strong acid condition in the stomach, the probiotic microorganisms taken orally have to defend against the bile salt in the gastrointestinal tract. Hence, bile tolerance is also considered to be one of the important properties required for high survival of the probiotic organism. Total viable count of *L. acidophilus* bacteria was decreased after 6 days of storage due to increase in acidity but it was still within acceptable range (>10⁶). Sensory evaluation data shows that the quality of sensory attributes (color, taste, aroma, appearance and overall acceptability) was slightly decreased after 6 days of storage but still had considerable acceptability. In recent years, there has been an increasing trend about incorporation of the health promoting bacterial species; *Lactobacillus acidophilus* and *Bifidobacterium longum*, into fermented milk products.

The panelists rated the samples for different quality attributes on 9-point Hedonic scale for their appearance, color, texture and flavor (Meilgaard *et al.*, 2007). The pH of all the flavoured milk samples at 1st day was found to be 4.5 but was continuously decreased during storage. After 6 days of storage the pH in all the samples was around 4.32. This decrease in pH is related to the production of lactic acid. (Table-3)

Table-3. pH analysis of flavored curd samples.

Sample	pH
Dairy curd	4.30
dairy curd+chilly	4.21
Monoculture curd	4.39
monoculture curd+chilly	4.38

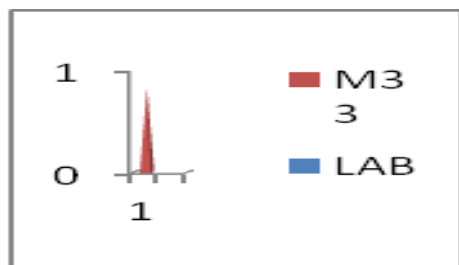


Figure: The graph shows Lactic acid bacterial cell survivability in pH 2.

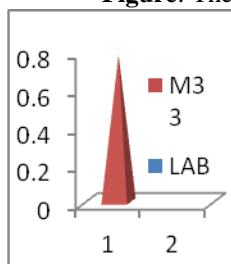


Figure: Graph shows survivability of Lactic acid bacterial cell in 1% bile concentration.

Table:4- Measure Hunter value of Curd (colour)

Sample	L*	a*	b*
Dairy curd	89.91	-1.23	13.48
Dairy curd+chilly	89.56	-1.37	12.94
Monoculture curd	89.68	-1.37	13
monoculture curd+chilly	89.69	-1.38	13.01

L, a, b, values represents brightness / darkness, green/ red and yellow/blue respectively. In the present study, the L, a,b, values of flavoured curd did not change significantly. It was comparable with that of dairy curd identically that the addition of flavour materials did not affect the appearance of the final product (Table-4).

Table 5. Summary of Sensory Evaluation Scores of Flavored Probiotic Monoculture curd Conducted at Day-1 (a) and Day-6 (b).

Attributes	Flavor	
	Green chilly	Gobo root
Color	7.4 ± 0.84	7.7 ± 0.95
Flavor	7.6 ± 0.69	8.8 ± 1.032
Time for setting	5---6 h	5- to 6 h
Over Acceptability	7.9 ± 0.57	8.9 ± 0.88

9-point hedonic rating scale (9= excellent;1=extremely poor) was used for sensory evaluation.



6 hour of incubation at 37° C

Table- 6. Summary of Sensory Evaluation Scores of Flavored Probiotic Dairy curd Conducted at Day-1 (a) and Day-6 (b).

Attributes	Flavor	
	Green chilly	Gobo root
Color	7.4 ± 0.84	7.7 ± 0.95
Flavor	6.6 ± 0.69	6.8 ± 1.032
Time for setting	10-12 h	10-12 h
Over Acceptability	6.9 ± 0.57	6.9 ± 0.88

9-point hedonic rating scale (9 = excellent; 1 = extremely poor) was used for sensory evaluation.

Overall acceptability is based on multiple organoleptic quality parameters i.e. color, flavor, texture etc. and shows the accumulative perception and acceptance by the panelists. Table -5 and 6, shows that the overall acceptability was around 7.9 in Green chilly flavored curd; however it was slightly higher (8.9) in Gobo root flavored milk. The overall acceptability was decreased after 6 days of storage and was around 6.3. The overall acceptability after 6 days of storage is considered still reasonable for a fermented dairy product.

Enumeration of Starter Bacteria

To assess the viability of the starter bacteria and the non-starter lactic acid bacteria, the cheese samples (5 g) were diluted in 45 mL of sterile 2% (w/v) trisodium citrate (Oxoid Ltd., West Heidelberg, VIC, Australia). The sample was homogenized at 10,000 g using a high speed homogeniser (Polytron, Kinematica, Lucerne, Switzerland) for 1 min to obtain a cheese slurry for the first dilution. The homogenizer was equipped with a shaft that could be detached from the rotor. This shaft was rinsed thoroughly with warm sterile distilled water to remove any residual cheese. The shaft was then sterilized with 80% (v/v) ethanol and dried between use for samples from different cheese batches.

Conclusion:

Dairy based products containing live bacteria are the main vehicles of probiotics to human. Probiotics have been proved to provide many health benefits. (Marteau, *et al* (2002), Klaenhammer, *et al* (2005) Meurman, *et al*, (2007) Twetman, (2008) are suggested that probiotic play a role in the maintenance of oral health. Non-dairy beverages would be the next food category where the healthy bacteria will make their mark. The rise in antibiotic resistant bacteria has scared the scientific community to the prophylactic and therapeutic uses of probiotics, and to reconsider them along with antibiotics (Ahmed, 2003, Shah, 2007)

Modern dairy science and nutrition have suggested the involvement of probiotic cultures and prebiotic ingredients in order to increase the nutritional value of dairy products, while minimizing detrimental effects on the sensory characteristics. The probiotic flavoured curd produced with different flavors in this study has been seen to have higher overall acceptability. The overall acceptability was slightly decreased after 6 days of storage. The total viable count was within the acceptable range up to 6 days of storage without affecting deleteriously other physicochemical parameters.

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