



Enhancement of Nutritional Value of Fermented Buttermilk using Vitamin A and D

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Abstract— *The demand of butter milk is increasing in the dairy industry. Traditionally, buttermilk is produced from curd or cultured milk. This study demonstrates that buttermilk has become a daily dietary drink with high nutritive value including vitamin A and D. process of buttermilk first taking pasteurized milk after boiling at 40°C in the present paper, a study was conducted for the development and characterization of functional cultured buttermilk utilizing vitamin A and D as per the standards of Recommended Dietary Allowance. The significance of the study is to increase the shelf life of product and to enhance the nutritional value by fortification of buttermilk for the consumption of human health. During fortification process other physical properties of buttermilk were not changed.*

Keywords— *Buttermilk, Vitamin A and D, Fortification*

I. INTRODUCTION

Buttermilk

Buttermilk is the aqueous phase released after churning of cream. The compositional and functional properties of protein, lactose, ph, ash, fat, and vitamins of sweet and sour buttermilk were determined at different pH levels and compared with those of skim milk and whey (Sodini *et al.* 2006). The consumer demand is growing for fiber fortification products due to their health benefits (Bary A. 2010). Buttermilk is similar to skimmed milk in composition with regard to the concentrations of proteins, lactose and ash (Lambert *et al.* 2016). Other industrial uses of buttermilk are to prepare functional mixes for various foods, such as sauces, chips, and chocolate products (Chandan *et al.* 1997).

Buttermilk, also known as chaach, with little developed acidity. It is mostly used summer season after add with black salt, cumin powder and chopped coriander leaves. Broadly, there are two types of buttermilk available in the market – sweet and sour. It represents an integral body part of a balanced diet and traditionally consume as a refresh drink in India. According to the report released by IMARC

(international market analysis research and consulting group)- "Buttermilk Market in India: Industry Trends, Growth, size, share, Opportunity and Forecast 2021-2026", buttermilk market exhibited strong growth during 2015-2020 in the India. As it relief from the burning heat of the sun, it has gained large popularity in India extremely hot summers. The demand for buttermilk is also increasing as it is good for digestion and boosts immunity. Moreover, buttermilk is widely used as an ingredient in the manufacturing of ice creams, dairy-based sauces and a number of confectionery products, which has further resulted in its increased demand. Looking forward, the buttermilk market in India is expected to grow at a CAGR of 22.4% during the forecast period (2021-2026).

Manufacturing cultured butter milk on industrial level involves selection of good quality raw material, standard cultures and optimized process of fermentation, packaging and storage.

True buttermilk is the fluid remaining after churn into liquid cream. When butter is made from sweet and sour cream, its rich and unique buttermilk has approximately the same composition as skim milk so skim milk is called

double toned milk. Cultured butter milk is prepared by souring butter milk commonly, skim milk with a starter culture that produces flavor. Starter culture Cultured butter milk is prepared by *Mesophilic lactic acid bacteria*.

Drinking of buttermilk after churning from dahi in country buttermilk is a very common habit in India. This product has most of the fermented milk solids except fat which goes in butter (mofpi.gov.in). It also has mixed lactic acid bacteria, especially *Lactococci* and *Leucostocs* which gives it a typical diacetyl flavor. There should be up to the mark balance between acid and flavor producers in the starter and making of Buttermilk is a fermented dairy drink.

Traditionally, it was the liquid left behind after churning butter out of cultured cream; most modern buttermilk is cultured, however. It is common use in warm climate.

Buttermilk can be drunk straight, and it can also be used in cooking. In making soda bread, the acid in buttermilk reacts with the raising agent, sodium bicarbonate, to produce carbon dioxide which acts as the leavening agent. Buttermilk is also used in Mari nation, especially of chicken and pork, which the lactic acid helps to tenderize, retain moisture and allows added flavors to permeate the meat (*Kanawjia, S.K., 2006*).

Operational definitions

Butter milk is a popular refreshing drink prepared from the by-product produced during the preparation of makkhan/butter from dahi. Butter milk is also known as Mattha, Chhachh in part of India. The sweet variety of the product is delight in the northern part and sour variety is preferred in the south in the country.

Fortification

Vitamin A and D

Vitamin A&D has been successfully added to foods such as milk (various forms of liquid and dry milk), buttermilk, cheese, flour, bread and cereal product, snacks, and beverages (*B. Kishore Babu & T. Pavan Sai 2021*). The most widespread application is in oils or fats that are dietary ingredients of most populations. It is essential that foods fortified with vitamin A are sealed in opaque or dark-colored glass containers with closures to eliminate the effect of light, a stimulant to oxidative processes. Edible antioxidants may also be added to protect both the oil and the added vitamin A from oxidation. Fortification of margarine is widely practiced (at levels of 20000–50000 IU kg⁻¹) to equal or exceed the average levels of this nutrient in butter. Often, vitamins D and E are also added. If synthetic β -carotene is also to be used, both color and vitamin A can be added simultaneously. When fat is removed from whole fluid milk, all fat-soluble vitamins, including vitamin A, are removed. All skim milk or low-fat

liquid or dry milk products should have vitamin A added and, if given to infants, should probably have vitamins D, E, and possibly C as well.

II. MATERIALS AND METHOD

Buttermilk

As for as functional buttermilk in modern times is concerned some important contribution were made in various parts of the world by various researchers like- Compositional and Functional Properties of Buttermilk A Comparison between Sweet, Sour, and Whey Butter Milk (Ammar Olabi et al., 2006). A comparative study of the fractionation of Regular buttermilk and whey buttermilk by micr

o filtration (R. Jimenez-Flores & P. Morin 2006). Sensory evaluation of whey and sweet cream buttermilk (Jinjarak et al. 2006) A study of the development and characterization of functional cultured buttermilk utilizing Aloe Vera juice (Deepak Mudgil & Sheweta Barak, 2016). Development of functional buttermilk by soluble fiber fortification (Deepak Mudgil & Sheweta Barak, 2016). A Study of the Effects of Supercritical CO₂ Treatment on Physicochemical Properties of Spray-Dried Buttermilk Powder to Develop a Novel Dairy Processing (Srineevasa raghavan 2018). Supplementation of buttermilk with red beet root for producing fermented milk beverage (Mohammed I. and Hashem 2018).

Material:

Using Pasteurized standardized milk with 4.5% fat and 8.5% SNF with the help of Granny's curd culture PRO TMB (natural 100% vegetarian) and using all equipments material for Researchers like- Fat analyzer, Oven, Desiccators, Weighing balance, Aluminum plate, Bottle (200) ml, Bottle cap, Butter churner, Filing machine, Capping machine, Laminar air flow, Incubator, Pipette, Spatula, Petri dish.

Method:Buttermilk

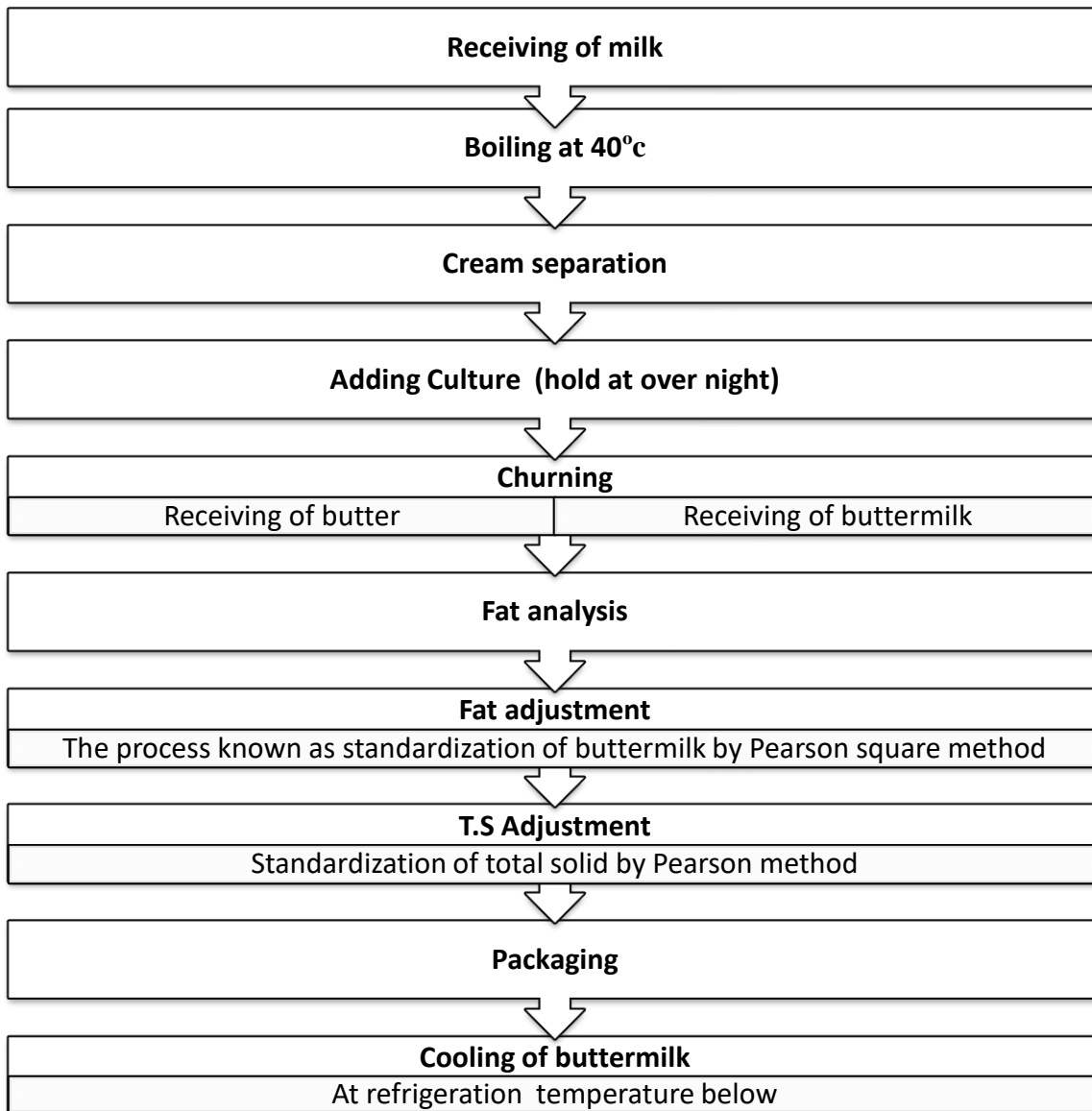
Milk is boiled and then cooled to 30° – 35°C. It is added with dahi culture or previous day's dahi at the rate of 1.0 to 1.5%.

Milk is allowed to set overnight. Set curd is stirred using a mathani (wooden/steel stirrer with impellers) driven by a small rope in to and-fro circular motion.

Small grains of butter are formed and raised to top of the vessel and it is scooped out from time to time. When all the butter is recovered, the residual watery fluid is referred as butter milk/chhach/mattha/chhas.

Buttermilk Process

A. procedure :-



Vitamin A&D

Method of fortification in buttermilk added premix of vitamin A&D ingredients like – add 1kg vitamin /50,000 liter of milk

Each 1kg premix contains:

Vitamin A – 60MIU (million international unit)

Vitamin D – 14MIU

When 50,000 – 1kg if, 1 liter – how much?

1liter – $1 \times 1000 / 50000 = .02$ gm

.02 gm convert into PPM (part per million)

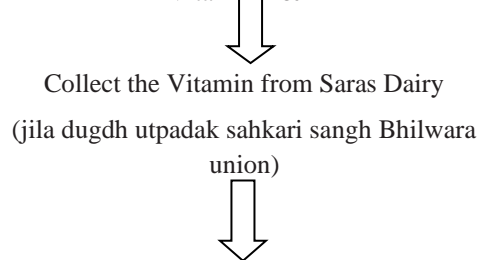
$.02 \times 1000 = 20$ PPM

Finally added vitamin 20 PPM /liter of buttermilk.

Vitamin A & D process

B. procedure

Vitamin A&D



Pristine lactovit vitamin Premix A&D

Chemical Analysis

Titrateable Acidity and pH

The titrateable acidity values of buttermilk samples were determined after mixing 10 g of buttermilk sample with 10 ml of hot distilled water (90°C). Phenolphthalein was used

as an indicator. The mixture was then titrated with 0.1 N NaOH to an endpoint of just appearance of faint pink color.

PH of buttermilk samples were measured using digital pH meter. All the measurements were made in triplicate and the results were expressed as mean.

Evaluation of Physical and Chemical Quality Parameters

1.1 Chemical Testing

Trail 1

S.N.	Parameters	T ₁	T ₂	Obtained/Mark
1.	Fat %	1.5	2.0	Not less than 1.5%
2.	SNF %	7.5319	7.198	
3.	Moisture %	90.9681	90.802	
4.	Total solid %	9.0319	9.198	Not less than 6%
5.	Acidity %	.270	.270	Not exceed to .5% LA
6.	Shelf life (day)	5	5	Good

Trail 2

S.N.	Parameters	T ₁	T ₂	Obtained/Mark
1.	Fat %	2.0	1.9	Not less than 1.5%
2.	SNF %	6.95	6.6	
3.	Moisture %	91.05	91.50	
4.	Total solid %	8.95	8.5	Not less than 6%
5.	Acidity %	.378	.378	Not exceed to .5% LA
6.	Shelf life (day)	5	5	Good

Trail 3

S.N.	Parameters	T ₁	T ₂	Obtained/Mark
1.	Fat %	1.5	1.5	Not less than 1.5%
2.	SNF %	6.1	5.0	
3.	Moisture %	92.4	93.5	
4.	Total solid %	7.6	6.5	Not less than 6%
5.	Acidity %	.360	.360	Not exceed to .5% LA
6.	Shelf life (day)	5	5	Good

Microbial Testing

S.N.	Parameters	(T ₁) Count CFU/gm or ml	(T ₂) Count CFU/gm or ml
1.	TPC	50	65
2.	Coliform	7	NIL



Final Product

III. RESULT

Increase the shelf life of product for longest time increase internal source of nutrition's specially vitamin A&D and no changes in buttermilk product like- Texture, color, tastes and not crossing parameters according standard. If check of the product in packaging like fresh food products.

IV. CONCLUSION

A study of the Development and characterization of functional cultured buttermilk utilizing vitamin A&D. according to RDA (Recommended Dietary Allowance) and I can further study on research topic at fortified buttermilk when we will consumption of 1 liter fortified buttermilk to take 20 µg Vitamin.

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