

Studies on the Development of Probiotic Buttermilk

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Abstract: *Butter is made by churning cream which separates the cream into butter solids and buttermilk. So in the simplest terms, buttermilk is the slightly sour liquid byproduct of butter making. As most cream is left to sour for 8 hours prior to butter making, buttermilk is often considered a 'fermented' or 'cultured' dairy product. Probiotics are the type of bacteria that are effective in helping and maintaining the nature's balance for gut microflora. According to WHO guidelines probiotics defined as 'live organism' which when administered in adequate amounts confer a health benefit on the host. The term buttermilk also refers to a range of fermented milk drinks. This buttermilk is produced from cow's milk and has a characteristically sour taste caused by lactic acid bacteria. This variant is made using one of two species of bacteria—either *Lactococcus lactis* or *Lactobacillus bulgaricus*, which creates more tartness. The tartness of buttermilk is due to acid in the milk. This process makes buttermilk thicker than plain milk. While both traditional and cultured buttermilk contain lactic acid, traditional buttermilk tends to be*

less viscous, whereas cultured buttermilk is more viscous.

Keywords: Buttermilk, Fermented Milk Product, Probiotic Food, Micro Organism.

Introduction: Probiotic, is usually a dairy food or a dietary supplement containing micro bacteria that replace or add to the beneficial bacteria normally present in the gastrointestinal tracts. In simple words probiotics are the good bacteria that aids in healthy digestion and also build immunity. In general Butter milk is easily available, nutritious and easy to prepare beverage available all round the year. It forms an integral part of a normal Indian diet. Butter milk is an important source of proteins and calcium especially for vegetarians. it has immense benefits,

having hundreds of thousands of probiotics (live bacteria) which are excellent for overall health. It contains good bacteria which improve digestion and metabolism. They also help in the absorption of other nutrients from food. Increasing per capita income, modernization, and increased awareness of health and wellbeing are a major reasons for growth of buttermilk in our country. IMARC research Group estimated buttermilk market to grow and develop at a sharp pace, according to their, comprehensive analysis report, and expects the packaged buttermilk market to have strong growth in the coming years.

Research Objectives:

- To prepare a probiotic buttermilk, with good sensory attributes.

□ To compare the viability of microorganisms used, both in encapsulated form as well as in curd culture form.

Review of Literature: Probiotics have long been a topic of discussion. In 1955, Lauren and Stew brought in the word probiotics, for the very first time. In accordance with their definition, the metabolic substances which are secreted from a microorganism that leads to growth enhancement for different other microorganisms are probiotics”.

Food & Agriculture Organization (FAO) and World Health Organization (WHO) (2002) in a report stated that such are the cultures of living microorganisms that can be either isolate or mixed cultures and when such cultures are

consumed by humans in adequate quantity, propose a health benefit on the host. A major expansion of the market for probiotics has encouraged advanced requirements for scientific research to incur benefits from the microorganisms. There are number of benefits of probiotics such as decrease in gastrointestinal disorders, Improved immunity, Improved and comfortable bowel movements, Immunity against, pollen allergens, less body toxins, decrease in flatulence & bloating of stomach, Resistance of proteins and lipids from oxidative damage. Negative after effects reported for probiotics consumption are very less seen and disease free adults can safely and carefreely consume prebiotics and probiotics in their diets.

Encapsulation: Encapsulation completely isolates its core from the surrounding environment until and unless its release is essential in answer to an external trigger also it gives protection to the core material against all odds during storage, processing etc. We can say that encapsulation is an advanced technology of coating various small sized particles which has been finely ground. It is an effective way to immobilized or entrap active agents within coated shell, and thus becomes an important tool for safe and site specific release of various biological active compounds, in our foods. An important aspect to be taken care is that encapsulated shell should be of food grade and also should be biodegradable and in this way should act as an efficient barrier against the

harsh surroundings. Also it's an excellent technique for preventing off taste of many oral constituents. Encapsulation is very much beneficial in providing encapsulated probiotics with resistant properties to protect against adverse and harsh environments. The best part is that this technique can be very widely and easily applied for all dairy products and can simulate digestion

Encapsulation techniques : There are numerous techniques by which we can encapsulate various food compounds, as most of the time the materials to be encapsulated are in liquid, form as a result majority of Technologies are based upon drying. For eg. Spray drying, Spray chilling, Spray bed drying, Fluidised bed drying, Extrusion

etc, Lyophilization, Centrifugal extrusion, Co-crystallization.

Coating Materials for Encapsulation:

The most important basis for selecting an encapsulating material is its functionality and suitability.

Encapsulating material should always all kinds of required conditions for their longevity. Materials that can be used to design the coating shell of encapsulates must definitely be food-grade. Generally, the materials, which are being used in the food sector, are mainly bio-molecules. The most widely accepted and used materials for encapsulation in food industry are Polysaccharides such as starch and their derivatives, plant exudates and extracts, marine extracts, microbial and animal sources of polysaccharides, proteins, lipids, Other materials viz.

paraffin, Shellac, Inorganic materials.

Hence we can say that there are a lot of materials to choose from, but cost factor will always remain an important aspect to think upon, before going for any coating substance. Another aspect is the physico-chemical characteristics of the materials chosen, and hence becomes a pre-requisite, for development of any encapsulated substance. So, a thorough study and analysis of all aspects becomes very necessary.

Probiotic species: Human intestine is an advanced and complex ecosystem, where thousands of bacteria reside and proliferate. These bacteria aids in absorption of non-digested dietary nutrients from the food example starch, polysaccharides, sugars etc. *Bifida bacteria species* can be easily found in

the large intestines of humans and animals (mammals). *It is* a type of species, which act as probiotic and impose many health benefits. It plays an important role in maintaining healthy digestive tract in humans as inside our body they compete for nutrients from the food. In the process of doing this they cling themselves to our digestive tract as wall and leave a very few nutrients for harmful bacteria to proliferate upon”.

We see a dozen of probiotic strain in everyday life but *Bifido bacterium* is one of the most versatile and the most searched bacterial strain in today's world. It is the most significant and important probiotics in the body, and among the first to colonize in the sterile GI tract of a newborn infant (also found in human

breast milk). Stimulates the immune response and promotes microbial balance by crowding out bad bacteria that cause discomfort and neutralizing everyday toxins in the gut.

Lactobacillus casei helps to control diarrhea. It has potential anti-inflammatory effects on the GI and aids in relieving antibiotic-associated diarrhea, produces lactic acid to lower the pH of the gut, impeding the growth of harmful bacteria, lives in the mouth and intestines of both infants and adults.

METHODOLOGY Preparation of Bacterial Strain: Bacteria strain used was pure isolate of strain BB12, that is *Bifidobacterium animalis subsp. lactis* , and was in the form of powder.

1. Ten, 150 mL round bottomed flasks were taken and cleaned using steam, and were placed in an inverted position until they were completely dried.
2. 100 mL milk was poured in each of the flask, and were covered with a cotton and aluminum plug.
3. All flasks were then placed in an autoclave for sterilization, set at a temperature of 122⁰ C and pressure 15 psi. After a desired temperature is achieved, flasks were removed from the autoclave and were kept undisturbed at room temperature for 24 hours.
4. After ensuring that there is no curdling in the milk flasks, transfer for probiotic culture is done.
5. Under aseptic conditions, in one of the milk flask, 1gm of BB12 strain is introduced, and thoroughly mixed. Flask is then placed in an incubator set at 37.5⁰C, it took 6 hours for the desired consistency. Flask is then transferred in refrigerator.
6. After continuous transfers to 4 different milk flasks, a final mother culture is prepared. With every transfer, settling time was reduced, indicating increased activity of microbes.

Process of Encapsulation:

Spray drying was the technique adopted for encapsulation. This method is very cost effective and leads to good viability of microbes, in the final product.

Preparation of Culture (non-encapsulated):

- In a new 100 mL milk flask, which has been previously sterilized, 1mL of mother culture is inoculated and incubated.
- After few hours, desired consistency is achieved and flask is then placed in a refrigerator, for storage.

Preparation of Culture for encapsulation:

- In six new 100 mL milk flask, 3% of thermal protectant (skim milk powder in this case) is added, and is then sterilised in an autoclave, with the same time-temperature combination.
- After complete and proper sterilisation, 1mL of mother

culture is inoculated in all the flasks.

- Flasks were then covered with cotton and aluminum cover and were placed in an ice-box, so as to maintain low temperature conditions.
- Contents of flasks were then emptied in a glass jar, and were spray dried.
- Following were the conditions

during spray drying: -

Inlet temperature for sample : 115⁰ C

Air pressure :

1kg/cm²

Outlet temperature : 100⁰ C

Probiotic powder obtained

: 7 gms

□ Probiotic powder is then inoculated in sterilized 100 mL milk flask, and is then incubated, until desired consistency is obtained which took 4 hours.

□ By giving consecutive transfers to three more milk flasks, probiotic culture got pretty active.

Preparation of Final Product (Buttermilk):

□ Two litres of toned milk was pasteurized in the temperature range of 82-88⁰ C for 30 minutes, in clean and completely sterilized containers.

□ Milk was then allowed to cool at room temperature, in the

temperature range of 45⁰ - 50⁰

C.

□ In two culture flasks, one liter milk was poured in each flask, and was then covered with cotton and aluminum cover. Flasks were marked as “1” and “2” , in order to keep a track of encapsulated and non - encapsulated product.

□ Under aseptic conditions, flask marked as “1” gets inoculated with encapsulated probiotic culture, and flask marked as “2” gets inoculated with normal probiotic culture.

□ Flasks are then placed in incubator, to get microbes proliferated. Flask “1” took 3 hours for desired consistency, while flask “2” took 4.5 hours for

desired consistency. Flasks are then placed in refrigerator overnight.

- The following day, both the flasks were thoroughly stirred, with the help of an electric stirrer, and water is added in the ratio of 60:40.
- With proper mixing of water, the final product is ready to be packaged, in 500 mL packaging.

Quality Tests Conducted: There are couples of method capable to detect the quality standard of butter milk. A few of them are illustrating below:

Coliform Plating: These tests are done in order to ensure no coli form colonies are present in the culture. Usually first dilution is taken for plating, in order to get the most accurate result.

Standard Plate Count or Total Plate Count (SPC/TPC): These tests are important, as a specific number of colony forming units are acceptable at market level, and also according to FSSAI rules and regulations. During the project, SPC/TPC test was important so as to ensure a minimum CFU required for a product to be declared as a probiotic product.

Furthermore, different testing methods are employed by different works; recitation about different test technique/ process. A small number of test methods used to check the standard /excellence of butter milk are Yeast Mold Count test, Compositional Tests like Fat Estimation Test, Acidity Test, SNF Test taken to get the best results

Conclusion: Probiotics in all these recent years have been found to be really effective for almost large number of diseases even including hypercholesterolemia. Use of such products help in enhancing and enriching almost all fermented products, and give a boost to human gastrointestinal tract. Due to huge availability of such probiotic products multiple claims are made regarding the health benefits of many microbial strains as there has been an increased inflow of probiotic products in Indian market place. The worldwide probiotic market in 2008 was US \$18.9 billion and is now approximately worth US\$ 45.7 billion in the recent time, hereas, in India, probiotic industry and market was around Rs 32.7 million with a projected growth rate of 33.5% uptill

2015. Probiotics strains most observed and studies being, *Lactobacillus* and *Bifido bacterium*. *Lactobacilli* and *Bifido bacteria*, both have been seldom blamed for human infections, many probiotic microbial strains are in use for decades and have been approved for their safety and assurance and are therefore, completely safe to use.

REFERENCES:

1. <http://sabardairy.org/RohtakPlan%20.aspx>
2. <http://www.imarcgroup.com/dairy-industry-in-india>
3. <http://www.pr.com/press-release/527554>
4. <http://indiamicrofinance.com/indian-dairy-industry-report-2014-pdf.html>
5. <http://www.big-consultants.com/images/Dairy%20Industry.pdf>
6. <http://www.dairyreporter.com/Markets/India-s-organized-dairy-sector-anticipates-rapid-growth-in-next-three-years>



7. <http://www.sciencedirect.com/science/article/pii/S2211601X11002665>
8. <http://www.ncbi.nlm.nih.gov/pubmed/10627837>