

Aim: Formation of probiotic yogurt and its important

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Abstract- Yogurt is one of the world's most widely consumed fermented dairy products. It has been recognized for its health and nutritional benefits due to its high digestibility, and bioavailability of protein, energy, calcium, and other micro and macronutrients. It also helps with immune function and weight management. The definition of probiotics has changed over time about both the growing interest in the use of viable bacterial supplements and the advancements in our understanding of their mechanisms of action. The purpose of this review is to provide a comprehensive overview of the various probiotic strains that can be used to make yogurt, a bacterial fermentation product that contains digested lactose and specific, viable bacteria, typically *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.

Key words: Probiotics, Dairy, Macronutrients, Fermentation, *Lactobacillus*, Supplement.

Introduction:

One of the most widely consumed fermented dairy products, yogurt has long been recognized for its health and nutritional benefits. *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, two lactic acid-producing bacteria, ferment whole, reduced-fat, and low-fat milk. Other bacteria, such as *Acidophilus*, can be added to the culture to produce yogurt [1]. Due to its high digestibility and bioavailability of nutrients, yogurt is considered a healthy food. People with metabolic disorders, lactose intolerance, and gastrointestinal conditions like irritable bowel syndrome, and inflammatory bowel disease might also benefit from this fermented beverage, which also helps with immune function and weight management.

Irritable bowel syndrome and motility bowel disease, and help regulate weight and immune function. In the form of the practice of consuming preserved foods obtained through the fermentation process, the significance of probiotics has long been recognized across civilizations and social classes. Since ancient times, the physiological activities of microorganisms transform locally available ingredients, which may be of plant or animal origin, into edible products through traditional fermentation processes [2]. The conventional matured food varieties are fundamentally gotten from dairy items viz. yogurt, dahi, kefir, cheese (after prolonged storage), fermented vegetable juices or juices from vegetables, and juices from fruits and berries that have not been fermented. Indigenous fermented foods have a long history of preparation and consumption and are closely associated with culture and tradition. Bacteria like *Bifidobacterium*, *Lactobacillus*, and *Streptococcus*, as well as yeast like *Saccharomyces boulardii*, are the organisms that have received the most research and are generally regarded as probiotics [3 & 4].

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The Origins of Yogurt

Most regulatory bodies around the world consider yogurt to be a fermented milk product that contains digested lactose and specific, viable bacterial strains, typically *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. It is a vehicle for fortification and a source of several essential nutrients, including protein, calcium, potassium, phosphorus, and vitamins B2 and B12 [7]. Over the millennia, yogurt has been known by a variety of names, including *Katy* from Armenia; *dahi* from India; *Abadi* from Egypt; the *Mast* from Iran; *leben raib* from Saudi Arabia; *laban* from Iraq and Lebanon; *roba* from Sudan; *iogurte* is from Brazil; *cuajada* is from Spain; *colada* is from Portugal; *dovga* is from Azerbaijan; and *matsoni* is from Georgia, Russia, and Japan. The domestication of milk-producing animals—cows, sheep, goats, yaks, horses, buffalo, and camels—is thought to have led to the introduction of milk products into the human diet around 5000–10,000 BC [8]. However, milk easily went bad, making it hard to use. Around then, herders in the Center East conveyed milk in packs made of the digestive stomach. It was discovered that milk that came into contact with the juices of the intestines became yogurt-like and sour, preserving it and enabling dairy products to be preserved for long periods [9].

The health benefits of consuming fermented milk products are mentioned in Indian Ayurvedic writings from around 6000 BC [10]. In Indian cuisine, there are currently over 700 yogurt and cheese products. Other than drying it, making yogurt was the only safe way to keep milk for millennia. In the Greek and Roman empires, yogurt was common knowledge. In 100 BC, the Greeks were the first to write about it and note that barbaric nations used yogurt. In the Bible, Abraham attributes his longevity and fertility to his consumption of yogurt. Additionally, the phrase "Land of Milk and Honey" is mentioned, which many historians have interpreted as a reference to yogurt [11].

Yogurt

Lactobacillus delbrueckii subspecies bulgaricus and Streptococcus salivarius subspecies thermophilus are used to produce yogurt, a bacterial fermented food product. The term "Yogurt cultures" was used to describe these lactic acid bacteria.

Lactic acid, which reacts with milk protein to give yogurt its texture and distinctive tang, was produced by these bacteria. Yogurt is considered a healthy fermented food for humans due to its high digestibility, and bioavailability of protein, energy, calcium, and other micro and macronutrients. When making yogurt, various types of milk are used, such as whole milk for full-fat yogurt (less than 3.25 percent milk fat), low-fat milk for low-fat yogurt (less than 2 percent milk fat), and skim milk for nonfat yogurt (less than 0.5 percent milk fat). Other dairy ingredients, such as cream and nonfat dry milk, are also used to adjust the yogurt's composition. Yogurt can also benefit from the addition of stabilizers—such as alginates, gelatins, gums, pectins, and starch—to enhance its body and texture. Stabilizers that keep the fruit evenly distributed in the yogurt and prevent the whey from separating (syneresis)[1].

Probiotic and other related terms

The word "probiotic" comes from the Greek word for "life." However, the definition of probiotics has changed over time about both the growing interest in the use of viable bacterial supplements and the advancements in our understanding of their mechanisms of action. This term was initially used to describe substances produced by one microorganism that stimulated the growth of other microorganisms. Later, it was used to describe tissue extracts that stimulated microbial growth and animal feed supplements that contributed to the balance of the intestinal flora in animals and had a beneficial effect on them[12]. Up until recently, the definition that was used the most was that of Fuller, which in several ways helped develop the idea of a probiotic: Live microbial feed supplements known as probiotics improve microbial balance for the benefit of the host animal[13]. Probiotics are now defined as "live microorganisms that when administered in adequate amounts confer a health benefit on the host," according to the Food and Agriculture Organization of the United Nations World Health Organization. By emphasizing that the beneficial effect is exerted by the microorganisms "when consumed in adequate amounts as part of food," the definition can be adjudicated about food[14].

Species of microbial probiotics that can be used to make yogurt

The number of microbial species that may possess probiotic properties is impressive when considering their definition. Table 1 contains a list of some of the most important representatives. Only strains that are classified as lactic acid bacteria are important to nutrition, and those that belong to the genera Lactococcus and Bifidobacterium have the most important properties in an applied context[15]. Lactic corrosive microscopic organisms are Gram-positive, catalase-negative bacterial species ready to create lactic corrosive as a primary final result of starch maturation. Because they use a different metabolic pathway, the genus Bifidobacterium is not listed among them phylogenetically but rather more traditionally. Streptococcus thermophilus and Lactococcus lactis, two of the most commercially important lactic acid bacteria, are two additional species that play an important role in the food industry, particularly dairy products but are not strictly considered probiotics[16].

It is important to note that because probiotic activities are related to strains, it is recommended to identify strains to determine their suitability and performance for industrial use. This is accomplished by combining phenotypic tests with genetic identification through the use of molecular methods like DNA/DNA hybridization and 16SRNA sequencing, among others[17].

Table:- Adapted from Holzapfel et al.,2001[18]

Microorganisms considered Probiotics	
<i>Lactobacillus</i> species	<i>Bifidobacterium</i> species

Commented [a1]:

<i>L. acidophilus</i> <i>L. casei</i> <i>L. crispatus</i> <i>L. gallinarum</i> <i>L. gasseri</i> <i>L. johnsonii</i> <i>L. paracasei</i> <i>L. plantarum</i> <i>L. reuteri</i> <i>L. rhamnosus</i>	<i>B. adolescentis</i> <i>B. animalis</i> <i>B. bifidum</i> <i>B. breve</i> <i>B. infantis</i> <i>B. lactis</i> ² <i>B. longum</i>
Other lactic acids bacteria	Nonlactic acid bacteria
<i>Enterococcus faecalis</i> ¹ <i>E. faecium</i> <i>Lactococcus lactis</i> ² <i>Leuconostoc meseneroides</i> <i>Pediococcus acidilactici</i> ³ <i>Sporolactobacillus inulinus</i> ¹ <i>Streptococcus thermophilus</i> ³	<i>Bacillus cereus var. to yoi</i> ¹ <i>Escherichia coli</i> strain nissle <i>Propionibacterium freudenreichi</i> <i>Saccharomyces cerevisiae</i> <i>S. boulardii</i>

¹Mainly used for animals.²Recently reclassified as *B. animalis* subsp. *Lactis*³Little is known about probiotic properties.

Production of yogurt

Yogurt starter cultures, which are used to make yogurt, ferment lactose, which is sugar in milk, and produce lactic acid in milk, which makes milk clot or form a soft gel. Milk fermentation also produces flavor compounds. A unique starter culture that contains a 1:1 symbiotic blend of two major bacteria, *S. thermophilus*, and *L. bulgaricus*, is used to make yogurt. *S. thermophilus* produces acid, whereas *L. bulgaricus* produces aroma components. When they grow together, their rate of acid production is much higher than when they grow independently. *L. bulgaricus*'s growth is sped up by *S. thermophilus*, which produces acid and carbon dioxide. *S. thermophilus* uses stimulatory peptides and amino acids produced by *L. bulgaricus*' proteolytic activity. Yogurt that has been freshly prepared typically has 10^9 cells per gram.

Different Kinds of Milk for Making Yogurt

Most mammals' milk can successfully ferment a probiotic strain that will continue to grow in such milk. Typically, cow, goat, and sheep milk are used, each with unique organoleptic and nutritional properties. In the past, raw milk was used. The microbial strain will also ferment sugary liquids like fruit juice, coconut water, beer wort, and ginger beer, in addition to milk substitutes like rice milk, coconut milk, and soy milk[19].

Vegetarian Protein Source

Vegetarians can get a lot of protein from yogurt, kefir, cottage cheese, milk, cheese, and other dairy products. However, people who are lactose intolerant might not like it[20].

Probiotic-rich Food Source

Probiotics found in yogurt are beneficial; bacteria flourish in the stomach and support a healthy digestive system. Irritable bowel syndrome, yeast infections, and Crohn's disease are just a few of the conditions that probiotics can prevent or even treat. Yogurt is made from milk, so[21].

Comparison Of Yogurt And Kefir

Kefir, on the other hand, contains several strains of friendly bacteria that are not found in yogurt, including *Lactobacillus* *Caucasus*, *Leuconostoc*, *Acetobacter* species, and *Streptococcus* species. Yogurt also contains beneficial bacteria. Kefir also has beneficial yeasts that help control and get rid of pathogenic yeasts that are harmful. Kefir can assist in the destruction of these pathogenic yeasts and their replacement if you suffer from *Candida* yeast overgrowth. Additionally, these yeasts make the intestines stronger, making them more resistant to pathogens like *E. coli*[22]. Another advantage of Kefir is that it is simple to make at home, which helps you save money. Whatever you prefer, you can use whole, low-fat, or non-fat milk. Kefir can also be made with rice, almond, soy, goat, or coconut milk. Just keep in mind that the finished kefir will be thicker the fattier the liquid[23].

Uses for Yogurt

- Yogurt can be eaten by itself. It can be spread on bread and biscuits, seasoned with herbs and spices, or used in a smoothie. A summer fruit or chocolate smoothie can be made.
- In dressing for salad. In dressings made from yogurt.
- For a delicious snack or meal replacement, combine yogurt milk with fruit, nuts, and granola.
- As sundaes: Use the recipe for a smoothie. After pouring the smoothie into the ice tray, insert toothpicks or Popsicle sticks into each square. Place the sticks on top of the saran wrap, making sure that each one has penetrated the wrap to remain in place[24][25].

Yogurt's health benefits

- Yogurt for skin care is a natural antioxidant. As a result, it keeps the skin looking and feeling young. It is also said to keep wrinkles, psoriasis, and acne at bay. Therefore, consuming yogurt daily will keep you looking young for a long time.
- Enhancement of brain function One of the important health benefits of yogurt is that it can improve brain function. It is regarded as food for the brain and aids in stress relief. Additionally, it enhances memory retention, focus, and reflexes.
- Digestion It is an excellent treatment for stomach-related conditions. Yogurt has a significant health benefit in that it improves digestion and prevents constipation. It aids in regularizing bowel movements and cleansing the intestines.
- Yogurt that is good for the heart also helps keep the heart healthy. Yogurt can help you control your blood pressure and clear your body's vessels. The heart becomes fit and healthy as a result.
- The respiratory system Yogurt also protects the lungs. It is said to treat respiratory issues of all kinds, from common ones like asthma to more serious ones like tuberculosis.
- Weight loss Yogurt is a godsend for people who want to lose weight healthily. It has probiotics that help the body burn fat faster. This, thusly, consumes the fat rapidly, prompting weight reduction. If you include yogurt milk with your workout, it will be more beneficial.
- Stress-buster

Individuals who have occupied plans incredibly benefit from the yogurt's medical advantages. Being a brilliant pressure buster is said. A glass of cold yogurt milk will help you relax and detoxify your body. Not just this, on the off chance that pressure is keeping you conscious around evening time, having the milk is smart.

- Yogurt improves the body's ability to eliminate harmful pathogens, such as viruses and harmful bacteria, for a stronger immune system. Moreover, the review showed that the cordial microbes in kefir can assist with annihilating growth cells. Although the research has not been replicated in humans, there is strong evidence that yogurt aids in the fight against cancer.
- Prevents aging Yogurt is high in antioxidants, which slow the aging process by reducing the impact of free radical damage to the body's cells and tissues and neutralizing free radicals by oxidizing them.

- Yogurt has antifungal properties as well as antibiotic properties; Psoriasis, candidiasis (a yeast infection), and eczema are just a few of the skin conditions it can help treat. Similar conditions, such as candidiasis (a yeast infection), heart disease, and HIV/AIDS, may benefit from using it.

- Yogurt with an anti-inflammatory agent can also be used to treat pancreatitis, gastritis, irritable bowel syndrome (IBS), ulcers, and other conditions. cures bad breath and gum-related diseases like periodontitis. Gainful in dealing with bone-related messes like joint pain, gout, stiffness, and other provocative sicknesses.

- Provides the body with vitamins Yogurt is high in fat-soluble vitamins like B12, B6, and B2, as well as important minerals like magnesium and calcium. These vitamins and minerals are essential nutrients that the body needs to keep every internal organ running smoothly.

- Lowers cholesterol levels Regular consumption of yogurt aids in lowering cholesterol levels. As a result, it aids in the prevention of numerous cardiovascular diseases like stroke and heart attack.

- Yogurt plays an important role in preventing toxins from entering the body by shielding it from radiation and other harmful pollutants. As a result, it contributes to improved immune function. Yogurt consumption helps maintain a youthful appearance and protects against the negative effects of aging.[26][27][28][29][30].

CONSUMPTION OPPORTUNITIES OF YOGURT

The majority of people around the world don't get enough dairy products to meet their needs for several nutrients, especially calcium. Lack of availability, lactose intolerance, and an allergy to cow's milk are three common barriers to adequate dairy consumption. The average daily intake of dairy products was 266 g in 16 EU countries that provided data on dairy consumption. Denmark and Finland have populations that consume close to 1000 mg of calcium per day, which is higher than most of the rest of the world. In the United States, 75%–90% of adult males and 90%–95% of adult females do not consume the three servings of dairy per day that are recommended [31]. Low calcium intakes are much worse in Brazil. In Brazil, 99 percent of adults do not consume the recommended daily allowance of calcium. Only 500–600 mg of calcium is consumed daily by 99 percent of Brazilian children [32]. The majority of people around the world don't get enough dairy products to meet their needs for several nutrients, especially calcium. Lack of availability, lactose intolerance, and an allergy to cow's milk are three common barriers to adequate dairy consumption. The average daily intake of dairy products was 266 g in 16 EU countries that provided data on dairy consumption. Denmark and Finland have populations that consume close to 1000 mg of calcium per day, which is higher than most of the rest of the world. In the United States, 75%–90% of adult males and 90%–95% of adult females do not consume the three servings of dairy per day that are recommended.10 Low calcium intakes are much worse in Brazil. In Brazil, 99 percent of adults do not consume the recommended daily allowance of calcium. Only 500–600 mg of calcium is consumed daily by 99 percent of Brazilian children [33]. Yogurt consumption is frequently a sign of economic change in developing nations. Even though yogurt consumption is low in Brazil, it increased by more than 7 times between 1974 and 2003 [34]. However, only 6% of the Brazilian population consumes yogurt, while 40% of the population consumes dairy products [32].

In general, women and people with higher socioeconomic status who are leaner, healthier, and more educated are more likely to consume yogurt. The majority of consumers in a survey of Sao Paulo, Brazil, population (G. Possa, R. Fisberg, and M. Fisberg, unpublished data) were younger, white, female, nondiabetic, nonhypertensive, more educated, and nonsmokers. Additionally, this has been observed among French and American populations [35][36]. Due to this new consumption pattern, it is possible that consumers are primarily interested in yogurt's health benefits. As a result, there is a window of opportunity to introduce novel preparation and presentation methods that could reach populations with the lowest yogurt consumption rates.

Yogurt has been shown to have beneficial effects on the gut microbiota, reduce the risk of gastrointestinal disease, and improve lactose intolerance (especially in children) in addition to meeting nutritional requirements[37][38], coronary heart disease[39][40][41], metabolic disease[39][42], and diabetes type 2[39][43], asthma and other respiratory conditions[44], in addition to improved bone and dental health[39][45][46][47], and the outcomes of pregnancy[40][48][49][50]. Therefore, yogurt may be an appealing dairy substitute for boosting nutrient intake, improving health, and assisting in the fight against the disease.

CONCLUSION

Yogurt is an ancient food that has been promoted as a healthy food for much of its history. It has been a part of the human diet for thousands of years. Yogurt is good to an excellent source of highly bioavailable protein, an excellent source of calcium, and a source of probiotics that may provide a range of health benefits, so a lack of consumption is a missed opportunity to contribute to a healthy lifestyle. Yogurt is a dairy food that can be eaten with any meal rather than a snack or a sweet. It has a lot of calcium and potassium, which is especially important for Asian, African American, and American Indian populations, which are most likely to have lactose intolerance and avoid dairy products.

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