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A Review: Production of Yoghurt and Its Health Benefits

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ABSTRACT: Yoghurt and milk are great nutritional content and pleasant sensory characteristics, milk and yoghurt are significant components of the human diet. Physicochemical changes occur during milk processing (homogenization, pasteurisation) and further yoghurt manufacturing (fermentation), affecting the flavour and texture of these products, while the creation of standardised techniques helps to generate ideal textural and flavour qualities. Yoghurt is a probiotic carrier food that can help the body absorb large amounts of probiotic bacteria, delivering a variety of health advantages.

"Bio-yogurts" is a typical term for these. Yoghurt is also reported to aid lactose tolerance, immune system enhancement, and the prevention of gastrointestinal issues. As a result of these well-known health benefits, consumer demand for yoghurt and yogurt-related products has soared, making it the world's fastest-growing dairy sector. This review will discuss the processes that occur during milk processing and yoghurt production using traditional industrial methods as well as newer methods (ultra-high pressure, ultrasound, microfluidization, and pulsed electric fields), as well as their impact on the texture and flavour of the final conventional or probiotic/prebiotic products.

I. INTRODUCTION

Yoghurt is a fermented milk product that aids in the preservation of milk's nutrients. Yogurts come in a wide range of fat content, from very low-fat fruit yoghurts to Greek-style yoghurt with a fat content of roughly 8 g per 100 g. Cow, ewe, goat, or buffalo milk can all be used to make yoghurt. This article examines the nutritional content of a variety of yoghurts, offers information on yoghurt consumption around the world, and explores the value of yoghurt for various demographic groups. Due to the high sensory quality of buffalo dairy products and the animals' high adaptability, there has been a recent increase in the demand for buffalo milk and the products derived from it. Additionally, a comparison of the gross compositions of the two types of milk reveals that buffalo milk is more nutritious than cow milk due to its higher concentrations of fat, protein, lactose, minerals, and vitamins. (Han *et al.*, 2012).

Yoghurt is a fermented dairy product created by two types of lactic acid bacteria, *Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp. Bulgaricus*, fermenting lactic acid. Yoghurt is a lactobacillus acidophilus-produced fermented dairy product manufactured from milk. *Streptococcus thermophilus* and *Lactobacillus bulgaricus* are two starter bacteria used in the manufacturing of yoghurt (Tewari *et al.*, 2019).

II. YOGHURT TYPES

To address nutritional needs, a variety of yoghurt kinds are currently available on the market. Yoghurt comes in a variety of textures, fat contents, and flavours (Mckinley, 2005). Yoghurt can be classified based on its physical and chemical properties, as well as added tastes and post-incubation treatments.

- Based on the chemical composition
 - ❖ Low fat
 - ❖ Full fat
 - ❖ Non fat

- Based on physical nature
 - ❖ Solid
 - ❖ Semi-solid
 - ❖ Fluid

- Based on the flavor of product
 - ❖ Plain/natural yoghurt
 - ❖ Flavored yoghurt
 - ❖ Frozen yoghurt
 - ❖ Concentrated yoghurt
 - ❖ Pasteurized yoghurt

Based on the method used in making them, yoghurts can be categorised into a number of different categories. In this section, only a few of the most well-liked yoghurt varieties on the market are discussed.

Balkans style Yogurt

Set-style yoghurt, also known as Balkan-style yoghurt, is made in small, individual batches after the warm cultured mixture is poured into containers, followed by an extended period of incubation without stirring for at least 12 hours to achieve the desired thickness and creaminess (Weerathilake, W.A.D.V *et al.*, 2014).

Greek style Yogurt

It is also known as yoghurt made in the Mediterranean style, which is thicker and creamier and usually made from plain yoghurt and whey or partially condensed milk. Because of its thick texture, it tends to withstand heat better than regular yoghurt and is used as a key component in making thick dips like tzatziki. It is a delicious product, but it also claims to contain a lot of fat, particularly saturated fat. However, given that a 150g serving will provide one fifth of the Recommended Daily Allowance for vitamin A, it is likely to be a rich source of vitamin A.(Dowded, A *et al.*, 2013).

Yogurt Fruit

There are two types of fruit yoghurts: one (sundae-style yoghurt) has the fruits arranged at the bottom of the packaging, and the other has the fruits evenly distributed within the yoghurt itself (Swiss-style yogurt) Fruit pulp or pieces are added during the production process to produce a variety of flavours while boosting sweetness and consumer appeal.

Ingredients used in yoghurt production

Yogurt is a dairy product created by inoculating one or more optional dairy ingredients with lactic acid-producing bacteria such as *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. Optionally, you can add one or more of the optional ingredients indicated below. All of the ingredients used are natural and safe. Before the addition of bulky flavours, yoghurt has a titratable acidity of not less than 0.9 percent, expressed as lactic acid, and contains not less than 3.25 percent milkfat and not less than 8.25 percent milksolids-not-fat (Hui, 1992). The fat content of yoghurt is highly debatable because some products, like Greek style yoghurt, have high fat contents of up to 10%. Unlike milk, the manufacturing processes used to make yoghurt, such as homogenization and fermentation, cause some fat to break down into easily absorbed and digestible fatty acids. . (Mckinley, M. c. *et al.*, 2005).



III. YOGURT MANUFACTURING PROCESS

Liquid milk/Concentrated milk/Milk powder



Initial treatment of milk



Milk Standardization



Homogenization



Heating



Cooling



Production of yoghurt

Milk receiving, testing and collection:

Raw milk is stored in silos, which are massive vertical tanks. These silos can hold between 25,000 and 150,000 litres (6,000 and 37,000 US gallons). The silos are located outside the dairy, with an outlet bay on the interior. A stainless steel tank is encased within the silos' double-wall design, which includes an outside welded sheet metal. The milk is agitated in the silos to prevent gravitational fat separation. The temperature of the milk in the silo must be kept below 4 °C. If milk is stored for lengthy periods of time at these temperatures, psychrotrophes can cause proteolysis and lipolysis (Chandan, 2006).

Initial treatment of milk

The first stage in making any sort of yoghurt is to make the Yoghurt mix (milk fat, milk protein, nonfat milk solids, sugar, stabilisers, flavours, and colours) and heat treat it. Yoghurt fat content varies depending on the type of milk used, and can be increased or decreased by adding skimmed milk powder, cream or butter fat, or whey concentrates (Weerathilakeet *et al.*, 2014).

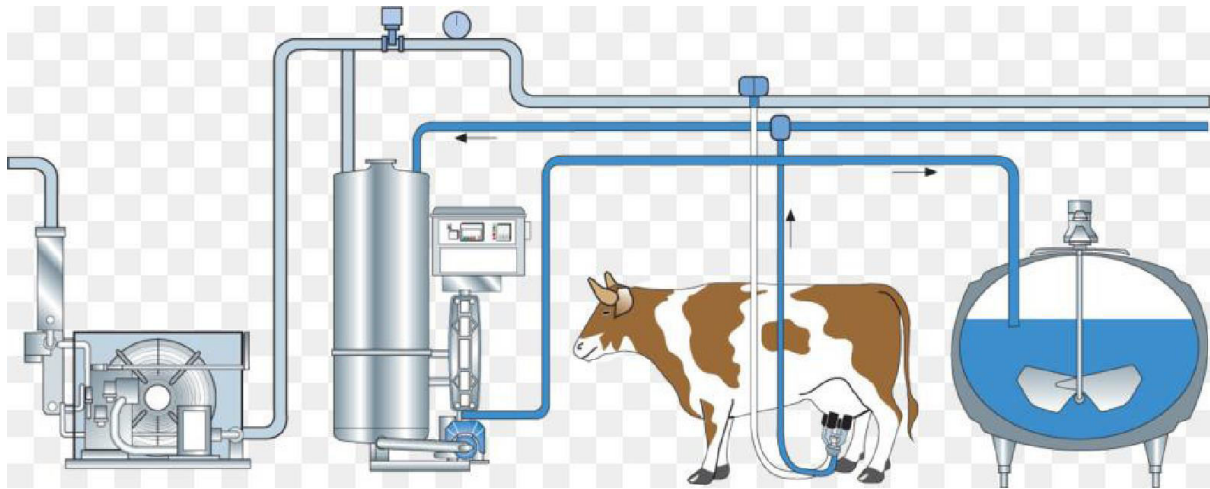


Figure 1: Milk from the cow is measured in-line and then sent to a bulk cooling tank.

Milk Standardization

The addition of sweeteners and stabilisers, as well as the standardisation of fat and protein levels, are all part of the milk production process. Milk is standardised at 550°C, and any excess fat content is removed using a centrifugal process. Nonfat yoghurt contains only 0.01 percent fat, light fat yoghurt contains 1-2 percent fat, and whole fat yoghurt contains >3.2 percent fat. Protein levels in the mix can range from 3-5 percent to up to 15% to improve the smoothness of the yoghurt and reduce syneresis. The most typical way, which is a simpler and more conventional method, is to add milk powder. Caseinates/whey powder are routinely used milk proteins

Homogenization

Homogenization is the process of breaking down fat globules into smaller sizes such that they are consistently distributed throughout the food matrix and their size is less than 1µm. In the case of high-fat yoghurt, homogenization is considered the most critical processing step. This procedure prevents the production of a distinct creamy layer on the Yogurt's surface (Chandan, Kilara *et al.*, 2013). Milk is homogenised for 10-17 minutes using 10- 20 MPa pressure in the first stage and 5 MPa pressure in the second stage (Lee, Lucey *et al.*, 2010). Ultra-high pressure homogenization has recently been adopted to boost the firmness and water retention capacity of commercial yoghurt over that of conventional (Serra M., 2009; Serra M., 2008).



Figure2:Homogeneous Machine

Heating

Heat treatment of milk is another key phase in the production of yoghurt since it affects the microstructure and physical aspects of the product, ensuring its safety. Heat treatment aids in the eradication of pathogenic bacteria found in milk or yoghurt mixtures, as well as the denaturation of whey proteins, resulting in a product with improved body and texture. It also encourages the growth of starter culture bacteria by releasing chemicals found in milk. (Lee, Lucey *et al.*, 2010). Dairy Consultant, 2013. Pasteurization is a continuous or batch procedure that involves heating milk to a high temperature and maintaining it at that temperature for a specific amount of time (Tamime, Robison *et al.*, 1999). On the basis of temperature and duration, various heat treatments can be applied.

Cooling

Yogurt is chilled to 5°C after the pH hits 4.5-4.6 to stop the fermentation process and further acid formation (Tamime, Robison *et al.*, 2007; Walstra, 2006). Yogurt cooling is divided into two phases: the first involves a rapid drop in coagulum temperature below 10°C, which inhibits the fermentation process and resulting in low viscosity yoghurt; the second phase comprises the commencement of a rapid drop in coagulum temperature below 20°C. The temperature of the yoghurt then drops to 5°C (storage temperature) with an increase in viscosity (Tamime, Robison, 2007, Walstra, 2006). Set Yogurts are promptly moved to cold stores or chilled in cooling tunnels after manufacture, whereas stirred Yogurts' coagulum is first cooled by agitation to smoothen the product before filling to containers. (Lee, Lucey *et al.*, 2010).

Health benefits of yoghurt

Yogurt is regarded as a nutrient-dense food because it contains vital nutrients for growth, including protein, vitamins, and minerals. Consuming dairy products like yoghurt improves the diet's overall quality and increases the likelihood that a person will meet nutritional guidelines like the Recommended Dietary Allowances for each nutrient on a daily basis. For instance, milk products, such as yoghurt, are a good source of calcium in bio-available form; a serving of 50 g of yoghurt is said to supply 41% of the recommended daily intake of calcium for a 5-year-old. As their health benefits are even mentioned in the Bible and the classical Hindu texts, it appears that the health benefits of fermented dairy products, including yoghurt, have been well-known for centuries. (Lourens-Hattingh, Viljoen, B. C. *et al.*, 2001).

It is widely acknowledged that optimal intestinal microflora balance is related to healthy eating and wellbeing. Furthermore, it is known that the main microbial strains connected to this balance are Lactobacilli and Bifidobacteria (Rybka, S., & Kailasapathy, K. *et al.*, 1995). Consuming yoghurt is also said to improve cytokine production, T-cell function, and natural killer cell activity, which improves immunity overall.

IV. CONCLUSION

Centrifugation, homogenization, heat treatment, and, in the case of yoghurt production, manufacturing and fermentation, are just a few of the scientifically intriguing processes used in dairy processing and yoghurt production. Whether it is milk or yoghurt, each process has a substantial impact on the end product's quality and sensory attributes. Thermalization, pasteurisation at low and high temperatures, ultra heat treatment, and sterilisation are examples of conventional heat treatment. Milk's flavour, microbial content, and milk proteins are all impacted by heat treatment. The modifications that take place are more drastic when the heat treatment is more intensive. The texture of the yoghurt produced is also impacted by heat treatment, which increases the value of its cohesion, stiffness, and viscosity. In dairy processing, homogenization is frequently used to reduce the size of milk fat globules and stop fat from separating from milk. Ultra high pressure, ultrasound, microfluidization, and pulsed electric fields are additional therapies that have the same homogenising impact on milk as pressure. Each method of homogenization has different impacts on milk and the yoghurt that is created. *Lactobacillus bulgaricus* and *Streptococcus thermophilus* are the bacteria that are used in the conventional fermentation process to manufacture yoghurt.

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