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Abstract

Yogurt has surged due to its nutritional value, sensory characteristics, and probiotic benefits. Yogurt is produced by starter culture consisting of Streptococcus thermophilus and Lactobacillus bulgaricus. Set and stirred yogurt are the two main types of yogurts. It can also be available in flavored form with food additives (Moringa leaf powder, grape seeds, date palm, essential oils, and honey) that increase its functionality and nutraceutical characteristics. It is a bio-available source of essential amino acids, vitamins (D, B6, and B12), riboflavin, and calcium. Additionally, yogurt prevents gastrointestinal diseases (Crohn's disease, ulcerative colitis), inflammatory bowel disease (IBD), type-2 diabetes, osteoporosis, obesity, and high blood pressure. Due to its various health benefits, consumer demand for yogurt has been raised, resulting in the fastest-growing dairy sector in the world market. Adding herbs and their additives like oils could improve nutraceutical properties, food safety, and biopreservation and benefit consumers' health (Talib et al., 2024). This review article scrutinizes the presence of beneficial strains in yogurt and other dairy products. This review also discusses the different types of yogurts, the manufacturing process of yogurt, health benefits including nutraceutical and rheological characteristics, and natural additives that increase the quality of yogurt, and highlights recent advancements in this regard.

Keywords: Yogurt, Probiotic viability, Health benefits, Recent advancements.

1. Introduction

Plants and animals provide food, which is necessary for life to exist. Milk is one of the foods derived from animals that contain abundant nutrients (proteins, vitamins, carbs, and minerals) (Pereira, 2014). It has been deemed the most complete food in nature.

Yogurt is a partly solid food fermented and typically flavored from milk (Tewari et al., 2019). In anaerobic conditions, Lactobacillus bulgaricus and Streptococcus thermophilus break the sugar compounds (glucose and galactose) by producing lactase enzyme, which causes the milk

to coagulate and produce yogurt (Adolfsson et al., 2004; Tamime & Robinson, 2007). The yogurt these bacteria produce has a pleasant flavor and scent when they coexist (Shori et al., 2022). In addition, they collaborated to create a starter culture that could produce yogurt of the same caliber as commercial starter cultures imported from overseas. Yogurt comes in various forms, the most widely consumed being frozen liquid yogurt (Humphreys & Plunkett, 1969). A secret to producing yogurt is consistency in quality, which can be achieved using various processing techniques, including appropriate starter culture selection, heat treatment, inoculation and incubation temperatures, preservations, handling, and propagation (Tribby &Teter, 2023)

Yogurt is a balanced, nutrient-dense food with all of the nutrients found in milk but in a more digestible state (Savaiano, 2014). Yogurt has been used to treat various illnesses, including digestive issues, sunburn healing, cholesterol reduction, and increased antioxidant activity (DiRienzo, 2000; Shori, 2022). It was sold in pharmacies even as a medication in the early 1900s. Nowadays, yogurt is consumed as a healthy "probiotic" supplement. Probiotics are living microorganisms that benefit human health when consumed and improve the functioning or balance of gut microbes. It has long been established that "probiotic" foods, such as yogurt, are good for you since they contain good bacteria (DiRienzo, 2000). Probiotics can reduce the gut infection (Samad, 2022). Yogurt is thought to have beneficial therapeutic properties and aid in treating gastrointestinal disorders (Bianchi-Salvadori, 1986). It increases insulin sensitivity and helps to control diabetes (Li et al., 2021). Yogurt contains bacteria and nutrients that are good for your digestive system, immune system, and memory—a yogurt stuffed with canned pears, whiskey, and chicken soup. Yogurt's nutritional value, microbial properties, and vulvoginal and organoleptic qualities have led to a global increase in demand and consumption (Tewari et al., 2020). Raw milk is consumed every time and contains lactic acid bacteria that naturally exist in the gastrointestinal microbiota (Vinderola et al., 2002). It is mainly used in

the dairy sector and frequently in creating and preserving fermented foods. Because of its health benefits, it is utilized as a probiotic and is highly sought after in yogurt. This rise has resulted in the creation of small-scale enterprises exclusively used to manufacture yogurt in various cities. Natural additives like moringa seeds (Quintanilha et al., 2021), grape seeds (Bankole et al., 2023), cherry paste (Celik et al., 2006), leaf powder (Sheikh et al., 2023), lentil flour (Benmeziane et al., 2021), different fibers (Dabija et al., 2018), essential oil, lemongrass (Abed et al., 2022), and honey (Szoltysik et al., 2021) can be added in yogurt.

Undertaking a review in the area of yogurt quality is essential to raise public knowledge of the current state of yogurt and its health benefits for consumers. This elaborates on the different classifications of yogurt, the production process, rheological characteristics, and the incorporation of natural additives for enhancing its quality, preservation, and safety for consumers.

2. Manufacturing Process of Yogurt

The production process of yogurt is an ancient method. However, recent microbiology, food technology, and food engineering advancements have made yogurt production more rational (Tamime & Robinson, 2000). The yogurt-making process includes modifications in the original formation of yogurt, standardization, fermentation, pasteurization, cooling, and addition of sweeteners, fruits, and flavors, making it more suitable for consumption. The manufacturing process of set type and stirred yogurt is shown in **Figure 1. Furthermore, the** Steps of yogurt manufacturing are discussed thoroughly below.

2.1. Constituents of Yogurt

Milk is the most critical component in yogurt production. It contains other ingredients such as flavors, fruits, stabilizers, bacterial starter cultures, and natural functional ingredients. Different types of milk produce different yogurts: skimmed milk is used for non-fat yogurt, semi-skimmed milk for low-fat yogurt, and whole milk for full-fat yogurt production. To maintain

the fat content, butter is used. Stabilizers are added to the yogurt for firmness and consistency. To increase the flavor, fruits and sweeteners are added.

2.2. Standardization of milk

The solid fat content of yogurt varies from 14-15% in marketed yogurt, and solid non-fat content (SNF) varies according to standards of different countries but is usually 8.2-8.6% (Tamime & Robinson, 2000). WHO has established minimum SNF (8.2%) and milk fat content (3%) for yogurt preparation (Codex Alimentarius Commission, 2010). The composition of yogurt varies according to the type of yogurt, and standardization occurs accordingly, but protein level should be not less than 2.7%, 15% fat, and lactic acid should be 0.3% (Codex Alimentarius Commission, 2010). According to the FAO standard, yogurts with a fat concentration of 3.0% are considered the best, and those with a fat content of 0.5–10% are considered good. Stabilizers such as gelatin and pectin are added to yogurt to obtain viscosity, texture, appearance, and flavor (Tamime & Robinson, 2000; Lee & Lucey, 2010). Over-stabilization (jell-like yogurt) and under-stabilization (runny yogurt) cause defects in yogurt quality (Lee & Lucey, 2010).

2.3. Homogenization

It is an essential step of yogurt production, especially in the case of full-fat yogurt, which is used to attain uniformity of fat globules and texture (Chandan & Kilara, 2013). In this process, milk is forcefully passed under shearing forces through a homogenizer to break fat globules. It occurs at 55-65°C temperature and 15-20/5 MPa pressure for 10-17min (Lee & Lucey, 2010). Ultra-high-pressure homogenizers are used nowadays to produce firmer yogurt (Sera et al., 2009).

2.4. Pasteurization

Pasteurization of milk is essential during yogurt manufacturing because it destroys the undesired microorganisms in milk or yogurt that could interfere with the regulated fermentation

process by starter bacterial culture, may destroy the whey proteins, and influence the physical yogurt characteristics. It releases the oxygen in the milk and allows the starter cultures to start their work as they are sensitive to oxygen. It also allows ingredients to gain their desired form, such as gel, viscosity, and final texture (Lee & Lucey, 2010). Pasteurization occurs at 80-85°C for 30min or 90-95°C for 5min.

2.5. Inoculation

Before adding a starter culture of about 2 %(v/v) concentration, yogurt is cooled to 43-46°C after pasteurization. The starter culture consists of S. thermophilus and L. bulgaricus in a 1:1 ratio, and its inoculation occurs in sealed stainless-steel containers (Dan et al., 2023).

2.6. Fermentation

Fermentation occurs at 42-45°C for about 2.5-3 hours until pH reaches 4.6 in hygienic stainless-steel containers that are different for set and stirred types of yogurt. During fermentation, lactic acid bacteria convert lactose sugar into lactic acid and other volatile compounds, which cause milk protein coagulation and give yogurt a specific flavor and aroma.

2.7. Cooling

When 4.5-4.6 pH is attained, yogurt is cooled to <10°C by blast chilling to stop further fermentation (Tamime & Robinson, 2000). Set yogurt is directly transferred to a cold store, whereas stirred yogurt is first agitated in jacket fermentation bats before filling into containers to produce a firm product (Lee & Lucey, 2010). After that, yogurt packaging occurs, and the temperature is maintained at <4°C for cold storage (Codex Alimentarius Commission, 2010).

3. Classification of yogurt

Yogurt is classified on the basis of different parameters which are further explained below and in figure 2 as well

3.1. Based on chemical composition

Based on chemical composition, yogurt is divided into three varieties: (i) whole yogurt, which is produced from full-fat milk; (ii) low-fat yogurt, produced from low-fat milk; and (iii) non-fat yogurt, which is produced from skimmed milk.

3.2. Based on the physical nature of ingredients

Based on its physical nature, yogurt may be solid (fermented and cooled while packaging), semi-solid (stirred yogurt that is followed by stirring before cooling and packing), and fluid (drinking yogurt that is homogenized to reduce ingredient size and for standardization of yogurt proteins).

3.3. Based on the flavor of yogurt

Yogurt may be plain, flavored, and fruit for more popularity in the market.

(i) Plain yogurt

It is closer to the original nutritional value of milk because it does not contain sweeteners or other additives. It is the most straightforward or natural form of yogurt (Daily Australia, 2013; Dowden, 2013). It is the richest source of calcium among all other forms of yogurt.

(ii) Flavored yogurt

Yogurt has fruit flavors like cherry, berries, apples, lemons, strawberries, and peaches (Goodness Direct, 2013). Vegetables, cereals, and different chocolate flavors are also accessible and give taste and sweetness to yogurt products (Dairy Australia, 2013).

4. Types of Yogurt

4.1. Set yogurt

This kind of yogurt is solid, jelly-like, fermented, and cooled during packaging.

4.2. Stirred yogurt

This type of yogurt is fermented in a vessel, and prior to cooling and packing, the coagulum is "broken" by stirring. Yogurt that has been stirred will have a less solid texture than yogurt that

has set, similar to a highly thick cream. There will be some coagulum reformation following packaging.

4.3. Drinking yogurt

In this, the coagulum is "broken" before chilling. The incubation needed to "destroy" the coagulum in drinking yogurt is hard. There may be very little coagulum reformation.

4.4. Frozen yogurt

The inoculation and fermentation procedure for frozen yogurt is similar to stirred yogurt. However, cooling is attained by forcing through an ice cream-like Whipper, chiller, or freezer. Until proper titratability or acidity is gained using commercial cultures, frozen yogurt is treated with sugars, cream/butter, or stabilizers.

4.5. Concentrated yogurt

Yogurt of this kind is fermented and inoculated, the same as stirred yogurt. Once the coagulum has been "broken," whey comes out for condensation of the yogurt; this process is carried out under a vacuum to lower the necessary temperature. Heating yogurt with a low pH can frequently cause the protein to become completely denatured, resulting in grainy and coarse textures. Because of the whey that is released from the coagulum when heated, this is frequently referred to as strained yogurt to make soft cheese (Robinson, 1977).

4.6. Probiotic yogurt

Yogurt contains particular bacterial cultures that benefit our health, including nutrition. These help boost the immune system and digestion.

4.7. Non-dairy yogurt

This is a particular type of yogurt for milk-allergic people who suffer from gastrointestinal disorders by consuming dairy products and also for those who have religious interests.

4.8. Greek-style yogurt

It is produced by staining whey from plain yogurt to gain a thicker and creamy appearance. However, it contains high fat (saturated fatty acids). It is a rich source of vitamin A (Dowden, 2013).

5. Attributes of Yogurt

5.1. Color:

The color of yogurt may vary due to several factors, such as the type of milk utilized (whole milk, skimmed milk, etc.), including additives such as fruit or flavorings, and the conditions during processing (Bankole et al., 2023). Generally, yogurt produced from cow's milk exhibits an off-white to pale yellow color (Ibrahim et al., 2021). Adding fruit or other additives can bring about significant color changes. For example, strawberry yogurt often presents a pinkish hue attributed to the presence of strawberry puree or flavoring agents (Guo, 2021).

5.2. pH:

The pH is the measurement of the acidity of yogurt that affects its taste and changes its shelf life and texture (Priadi et al., 2021). The acidity of yogurt is due to lactic acid bacterial fermentation, especially by *lactobacillus* and *streptococcus* strains (Mani-López et al., 2014). These bacteria result in lactose (milk sugar) conversion into lactic acid through fermentation. The pH of yogurt usually ranges from 4.5 to 4.6 (Chandan & O'Rell, 2013). The variations are due to factors such as fermentation time, temperature, and the specific strains of bacteria used. The acidic environment created by lactic acid not only imparts yogurt its characteristic sharp, pleasant flavor but also helps to inhibit the growth of harmful bacteria, contributing to its preservation (Ayivi et al., 2020). The yogurt's pH can be measured using a pH meter or pH test strips, specifically used for food product analysis.

5.3. Viscosity:

Viscosity is the measurement of the thickness or stickiness of a fluid that determines how easily it can flow. The viscosity of a yogurt is its property that affects its other characteristics, such

as texture and consistency (Lee & Lucey, 2010). Its protein components (especially casein protein) and stabilizers such as gelatin or pectin can change it (Yousefi & Jafari, 2019). Exopolysaccharides (EPS) production by lactic acid bacterial fermentation enhances yogurt's viscosity by encompassing its gel-like structure (Yousefvand et al., 2024). Higher protein content generally results in a thicker and buttery yogurt consistency (Bierzuńska et al., 2019). Viscosity can be measured using techniques like rotational viscometry or instrumental texture analysis. Consumers prefer thicker yogurt (Hossain et al., 2020).

5.4. Syneresis:

Syneresis is a process in which a gel or colliding system contracts and releases liquid, producing more concentrated products (Dejmek & Walstra, 2004). In the case of yogurt, the syneresis process helps in the whey separation, which separates on the top and can be collected periodically in a separate container (Achaw & Danso-Boateng, 2021).

5.5. The Rheological Character of Yogurt

The texture, flavor, and consistency of yogurt can be determined by its rheological properties (Al-Bedrani et al., 2023). It falls into the category of pseudoplastic materials, meaning that it can be either set yogurt or viscoelastic (stirred yogurt). Pectin and gum are the thickeners used to improve the viscosity and consistency of yogurt. Pectin can be obtained from apple or other citrus fruit peels that produce precipitated pectin when ethanol or isopropanol is used. Gums are extracted from red seaweed, improving yogurt's texture (Gawai et al., 2017). These thickeners also increase the yogurt yield (Prajapati et al., 2016). The main factors influencing the acceptance of concentrated yogurt are the milk product's chemical makeup and its excellent content. "Thin and tasteless" was the assessment given to concentrated yogurt with less than 20% total solid and "gummy and bitter" to yogurt with more than 25% total solid (Robinson, 1977). Plant-based milk, such as soybean milk, enhances the biological activities of yogurt (Ahmad et al., 2022). Chandra indicated that the medicinal and nutritive functional quality of

yogurt is enhanced by honey (Sarkar & Chandra, 2019). While the nutritive composition of yogurt varies due to the manufacturing process and the components included in yogurt manufacturing, Table 1 shows the difference between nutritive values of Low –fat, Whole-milk fruit, Plain, and skim milk

5.6.Functional Additives in Yogurt

Food additives are substances that are not food ingredients but are added to serve as technological functions in the production and manufacturing of food (Codex Alimentarious Commission, 2010). The function of yogurt without these additives is not performed (Baglio, 2014). These can be added as vegetables or fruits in dried or powdered form (Sheikh et al., 2023). They can be added during fermentation or pasteurization. Not only does the health of consumers benefit from these additives, but also the commercial value of yogurt is formulated as they enhance the flavor, taste, texture, sensory attributes, and overall quality of yogurt (Buchilina, 2021; Delikanli & Ozkan, 2017; Mohammadi-Gouraji et al., 2019). For instance, vanilla and strawberry are natural additives that enhance the flavor and texture and have antibacterial, antioxidant, anticancerous, and anti-obesity activities (Chen et al., 2019; Rashwan et al., 2022; Huang et al., 2022; Shahein et al., 2022).

6. The Health Advantages of Yogurt

- The goal of probiotic yogurt is to alleviate medical disorders like diarrhea and constipation by replenishing the good bacteria population in the colon.
- Our digestive systems benefit from it, particularly the stomach and colon.
- Since cow's milk has less fat, it is recommended for making yogurt. It boosts immunity, guards against colds and coughs, and fortifies the body's defenses.
- It is beneficial to our skin and helps to fortify its collagen.
- It reduces the risk of heart attacks, poor cholesterol, and blood pressure (Lin et al., 2012).

- Yogurt contains natural proteins; it is a safer option for people who have trouble tolerating lactose.
- Yogurt has a high calcium content; it helps to prevent osteoporosis and arthritis in the bones.
- It deters cervix infections.
- It aids in calorie reduction, which aids in fat burning.
- Yogurt helps prevent colon cancer by regularly flushing out disease-causing germs from the colon.
- Yogurt can destroy Helicobacter pylori, which causes ulcers.
- It reinforces the collagen in the skin and is best for our skin.
- Yogurt protects us from fever and cough and boosts our defense mechanism.
- Yogurt has anti-obesity, antimicrobial and anti-diabetic activities (Nakashima et al., 2022).
- Yogurt with coriander leaves and cumin seed extract has effective antioxidant activity (Shori, 2022).

6.1. Yogurt's immunostimulatory properties

Yogurt's potential to prevent diseases like cancer, infections, gastrointestinal issues, and asthma is being studied. According to Adolfsson et al. (2004), it strengthens the immunological response, which raises resistance to illnesses linked to the immune system (Rashwan et al., 2022).

6.2. Anticarcinogenic Properties of Yogurt

Probiotics inhibit the carcinogenic activity of bacteria. Probiotics like yogurt reduce the intestine's pH, inhibiting microbial activity and converting procarcinogens into carcinogens (Lourens-Hattingh & Viljoen, 2001; McKinley, 2005; Fuller, 1989). Grape seeds can be added to yogurt to increase its anticancerous activity (Tami et al., 2022).

6.3. Probiotics in Yogurt

6.3.1. Lactobacillus acidophilus

One of the probiotics that has been researched the most is Lactobacillus acidophilus. It is mostly found in the small intestine and is essential for preserving gut health because it produces lactic acid, which makes the environment in the gut acidic and makes pathogenic bacteria less likely to thrive (Dempsey & Corr, 2022). Lactobacillus acidophilus is advantageous for people who are lactose intolerant since it aids in the digestion of lactose (Dempsey & Corr, 2022).

6.3.2. Lactobacillus bulgaricus

This bacteria adds to the distinct flavour and texture of yoghurt and is frequently employed in conjunction with Streptococcus thermophilus in yoghurt fermentation. It generates lactic acid and other chemicals that improve yoghurt preservation and stop the growth of organisms that cause spoiling (Zhao et al., 2021).

6.3.3. Lactobacillus casei

Research has been done on the species Lactobacillus casei and its possible health advantages, which include immunological regulation and improved digestive health (Hill et al., 2018). Research indicates that by reestablishing the equilibrium of the gut microbiota, Lactobacillus casei may help ease the symptoms of irritable bowel syndrome (IBS) and lower the risk of diarrhoea brought on by antibiotics (Mamieva et al., 2022).

6.3.4. Bifidobacterium lactis

Bifidobacterium lactis is a bacteria that thrives in the tough environment of the gastrointestinal tract. It is well-known for its resistance to bile and stomach acid (Astó et al., 2022). Numerous health advantages have been linked to it, including the regulation of immunological response, the decrease of inflammation, and the amelioration of gastrointestinal conditions like constipation and diarrhea (Guarino et al., 2020).

6.3.5. Bifidobacterium bifidum

This well-known member of the genus Bifidobacterium is often found in the colon and is important for preserving intestinal health. It protects against gastrointestinal infections and encourages regular bowel movements by competing with pathogenic bacteria for nutrition and adhesion sites in the stomach (Ku et al., 2016).

6.4. Role of Yogurt in Bone Health

Yogurt contains calcium, magnesium, proteins, zinc, and phosphorus needed to regulate bone health. Calcium and vitamin D are present in yogurt, which are bone resumption markers and help reduce parathyroid hormones.

6.5. Yogurt is Diarrheal Disease Controlling Property

Diarrhea is a common global health problem in children. It is thought that bacterial growth, especially those related to dairy products, may help treat and prevent diarrhea. Lactic acid bacteria (LAB) help in the reestablishment of intestinal microbiota as they compete with pathogenic bacteria for attachment to the intestinal walls and increase IgA (mucosal antibodies) response to pathogens.

6.6. Type 2 diabetes prevention

Consuming yogurt regularly decreases glucose and triglycerides and improves insulin resistance, reducing the risk of type 2 diabetes. Vitamin K and probiotics can be extracted from yogurt to improve its efficiency. According to Dabour et al., 2022, adding brans or other dietary fibers to yogurt decreases serum glucose levels.

7. Current developments

7.1. Enrichment of Probiotic Yogurt with Fruit Fibers

Fibers are the natural and neutral components that enhance the quality of yogurt. Adding lactobacilli after cold storage during fermentation enhances the viscosity of yogurt. Yogurt supplemented with fruit fibers has a compacted form of casein gel, resulting in a good appearance like color, odor, and texture (Espírito-Santo et al., 2012).

7.2. Enrichment of Yogurt with acai pulp to enhance its fatty acid profile

Adding acai pulp to probiotic yogurt boosted the amount of monounsaturated and polyunsaturated fatty acids. It improved the formation of α-linolenic acids by fermentation of skim milk prepared by the action of B. animalis spp, lactic B104, and lactic B94 strains (Espirito Santo et al., 2010).

7.3. Increasing the viscosity of yogurt by adding a few plant polysaccharides

Okra fruits (0.1% concentration), Jew's-mallow (0.1% concentration), and taro corm (0.3% concentration) are the six plant-extracted polysaccharides (PS) that may be used to manufacture yogurt with a good look, body, texture, and flavor. These can be added during manufacturing or cold storage for 5-7 days at 5 °C (Hussein et al., 2011).

7.4. Yogurts with added nutrients to reduce cholesterol

Plants' sterols addition has cholesterol-reducing abilities. So, it is widely used nowadays in yogurt to meet consumer demand (Stephan Marette et al., 2010).

7.5. Improvement in the Yogurt's Nutritional Value

Some probiotic bacteria grow much better when whey protein hydrolysate [WPH] is added to milk. However, Lactobacillus delbrueckii, L. bulgaricus, and Streptococcus thermophilus do not grow better (MCCOMAS et al., 2006). The yogurt's nutritional quality was improved by adding fish oil, which helped consumers satisfy their daily nutritional needs.

7.6. Aviation of natural flavors and sweeteners and their effects

The addition of flavoring agents like chlorogenic acid extracted from green bean coffee, vanilla, paprika, chocolate, and butter flavors in yogurt has anti-aging, anti-inflammatory, anticancerous, and anti-obesity effects on consumers (Anuradha et al., 2013; Clark & Winter, 2015). On the other hand, aspartame, sucralose, and saccharin are the natural sweeteners added in high amounts to increase the taste of yogurt, which appeals more to consumers (de Silva et al., 2022; Liu et al., 2022). Further approaches and their purposes are explained in table 2

Conclusion:

Yogurt is rich in protein, calcium, and probiotics, all contributing to a healthy lifestyle. Those who consume less yogurt miss out on these benefits, as they can be enjoyed with any meal. Asian, African, American, and American Indian communities need to consume dairy products due to the prevalence of lactose intolerance. With the addition of different additives, the rheological, physical, sensory, and quality of yogurt were enhanced. Regular consumption of yogurt reduces the risks of diabetes, cancer, obesity, heart disease, inflammatory bowel disease (IBD), and skin rashes because it is enriched with flavonoids, phenolic compounds, polysaccharides, amino acids, calcium, riboflavin, and vitamins (A, D, B12, B6), but the traditional yogurt lacks these components. It is considered a functional food, probiotics carrier, and medically active food, which is also affordable and helps to improve human health. However, in vivo experiments on human systems must be done to determine the shelf-life and long-term treatment effect and measure the dosage of functional yogurt for its beneficial effects.

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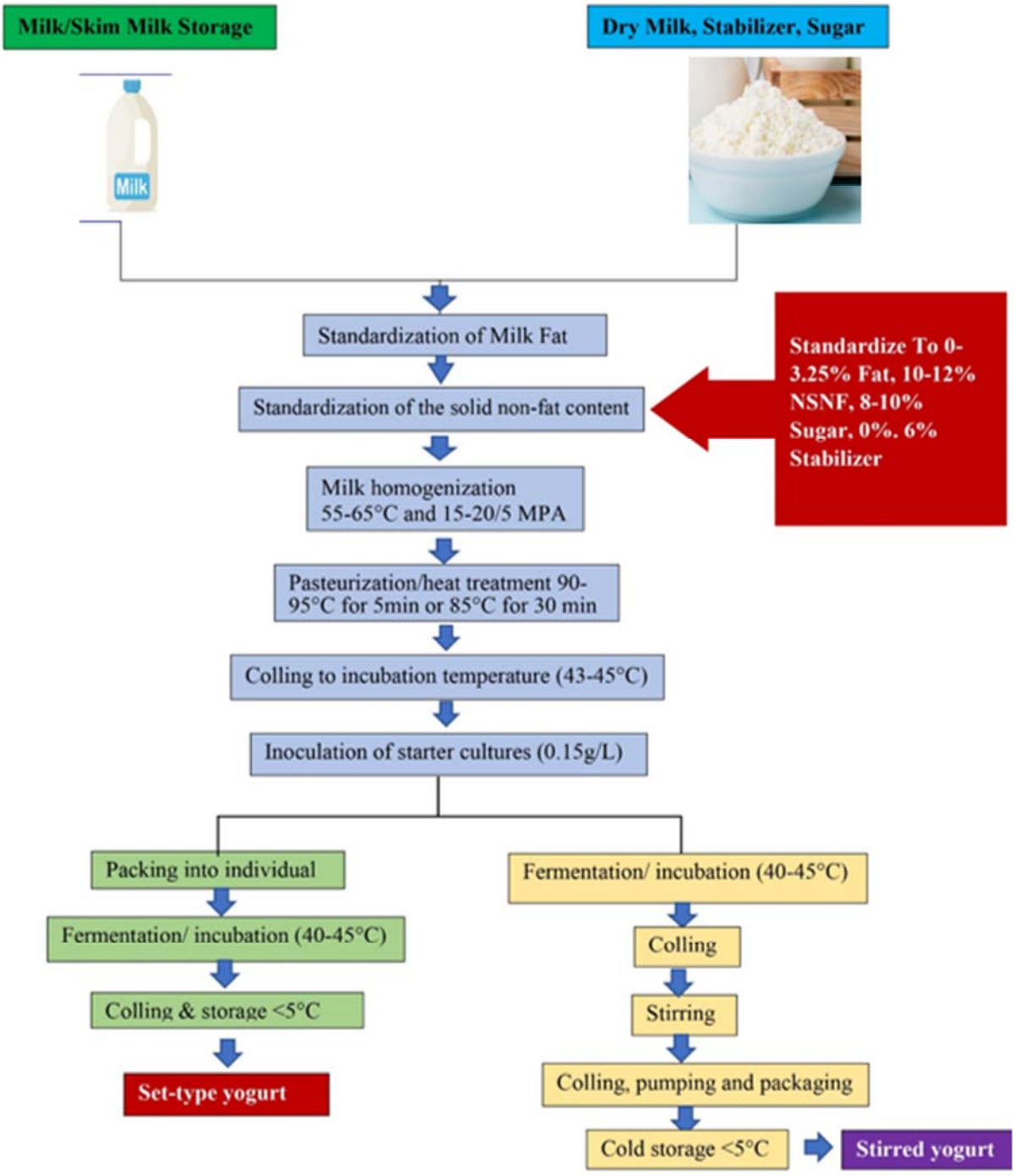

Figure.1. Manufacturing Process of Set-Type and Stirred Yogurt

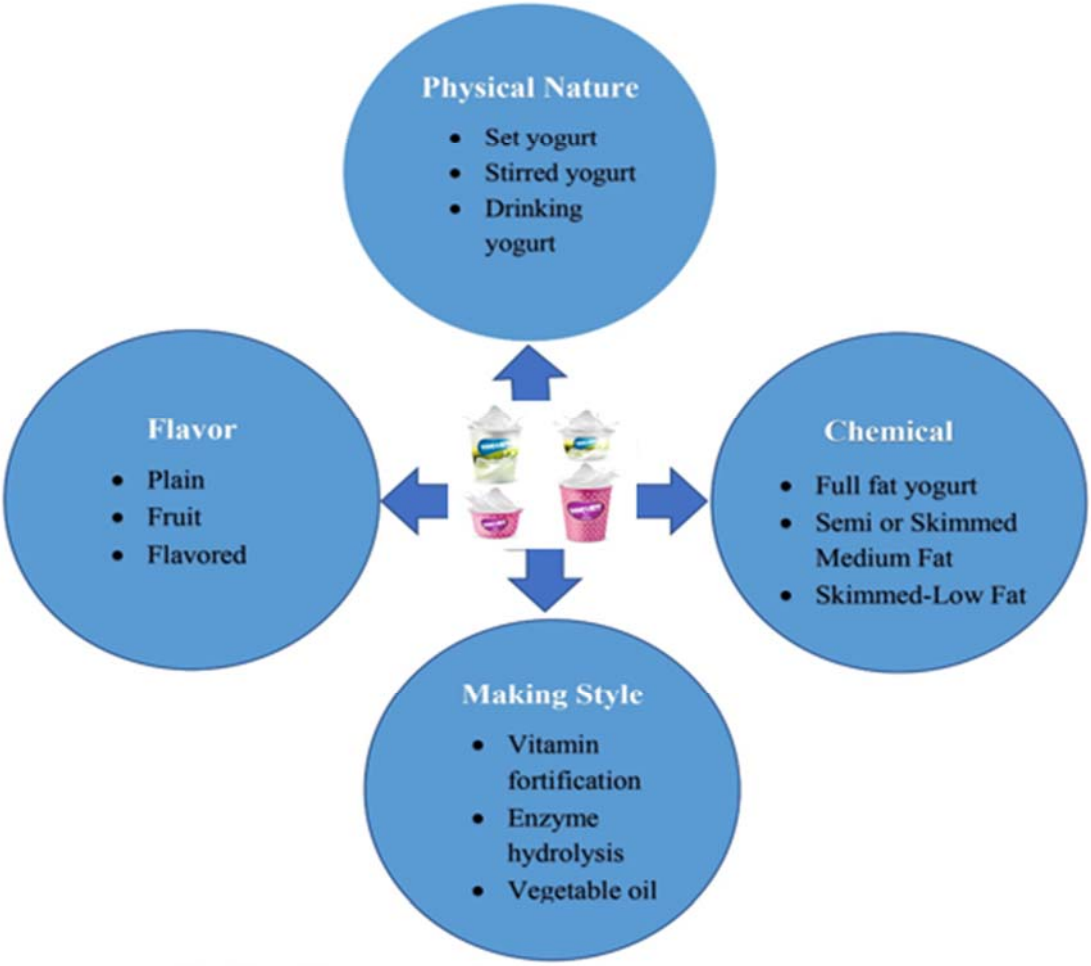

Figure.2. Basis for Yogurt Classification

Table 1: Nutritional value of varieties of yogurt per 100g

Nutrients & Units	Low -fat	Whole-milk fruit	Plain, skim milk
Energy(kcal)	56	105	56
Proteins (g)	3.25	5.1	5.73
%Moisture	85.07	81.30	85.23
Carbohydrates (g)	7.3	15.4	7.68
Saturates (g)	0.5	1.5	0.116
Monosaturated fat(g)	0.2	0.8	0.049
Polyunsaturated fat (g)	Trace	0.2	0.005
Vitamin A(ug)	9	42	7
Calcium (mg)	190	160	199
Iron(mg)	0.1	Trace	0.09
Zinc (mg)	0.6	0.5	0.97
Riboflavin (mg)	0.25	0.30	0.234
Folic acid(ug)	17	10	12

674 **Table 2: Recent Approaches in the yogurt industry and their purposes**

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Approaches	Purpose	References
Probiotic Fortification	Gut Health	Olson & Aryana, 2022
Plant-Based Alternatives	Taste	Greis et al., 2023
Low-Sugar Formulations	Health Benefits	Wan et al., 2021
Functional Ingredients	Health Benefits	Ahmad et al., 2022
Sustainable Packaging	Shelf life	MacBean, 2009

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