



Yoghurt Processing

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1. Introduction

- A dairy product made by controlled fermentation using certain bacterial culture grown in symbiosis condition.
- It involves microorganism:
 1. *Lactobacillus bulgaricus* and
 2. *Streptococcus thermophilus*,
- Sensory characteristics of yogurt:
 - smoother texture
 - more consistent flavor
 - Tart taste
 - Custard-like consistency
- Yogurt offers a delicious and probiotic-rich food option to consumers other than curd.



1.1 History of Yogurt

- Yogurt, originating from domesticated goat and sheep milk, originated in **Mesopotamia** around 5000 B.C., forming curds from naturally occurring bacteria.
- Yogurt, derived from Turkish "yoğurmak," and referred to have health-promoting properties since 6000 BC in Indian Ayurvedic scripts.
- When Spanish yogurt manufacturer **Isaac Carasso** started blending yogurt with jams, the product became commercially successful.
- The first laboratory and factory started at:
 1. France: 1932
 2. United state: 1941.
- It gained popularity in the US in the past 30-40 years.

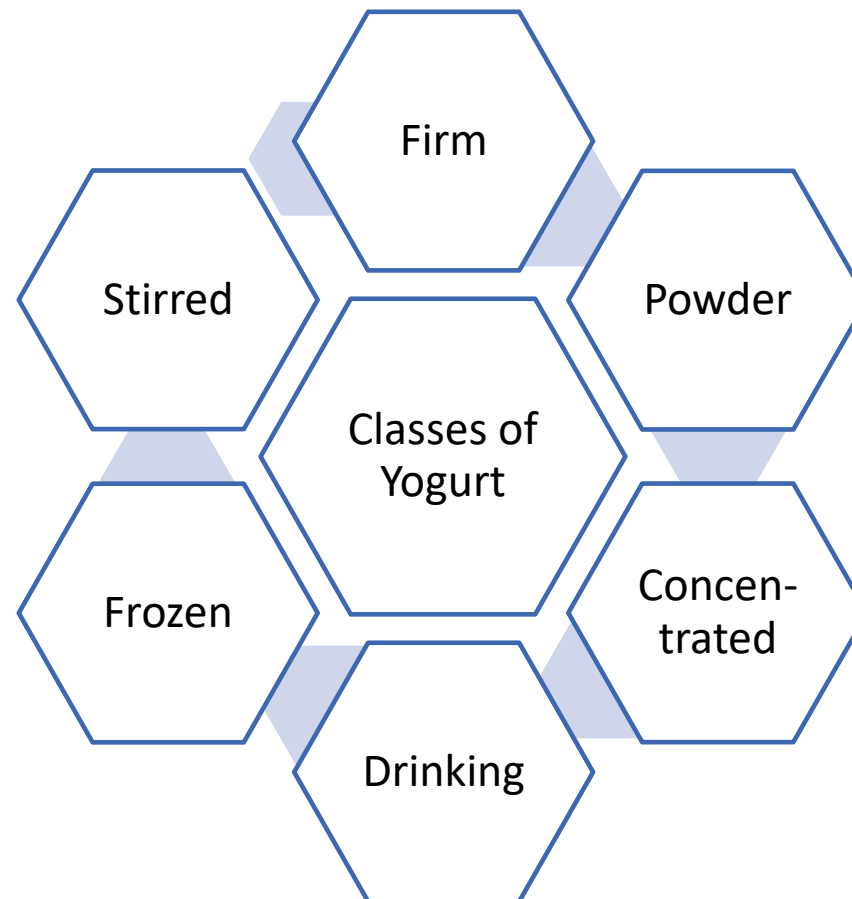


1.2 Nutritional Status of Yogurt (per 100 g)

#	Parameter	Values
1.	Energy	61 Cal
2.	Carbohydrates	4.7 g
3.	Sugar	4.7 g
4.	Protein	3.5 g
5.	Fat	3.3 g
6.	Cholesterol	0.01 g
7.	Calcium	125.9 mg
8.	Sodium	48.08 mg
10.	Phosphorus	99.14 mg
11.	Riboflavin	0.14 mg

1.3 Classification of Yogurt

Today, there are more than 700 yogurt found in Indian cuisine. Hence, classified as following depending upon their forms:



2. Raw Material

1. Milk (Various type)

2. Additives; Stabilizer*, Emulsifiers**, Sweeteners, & Flavors***

3. Fruits

4. Bacterial cultures

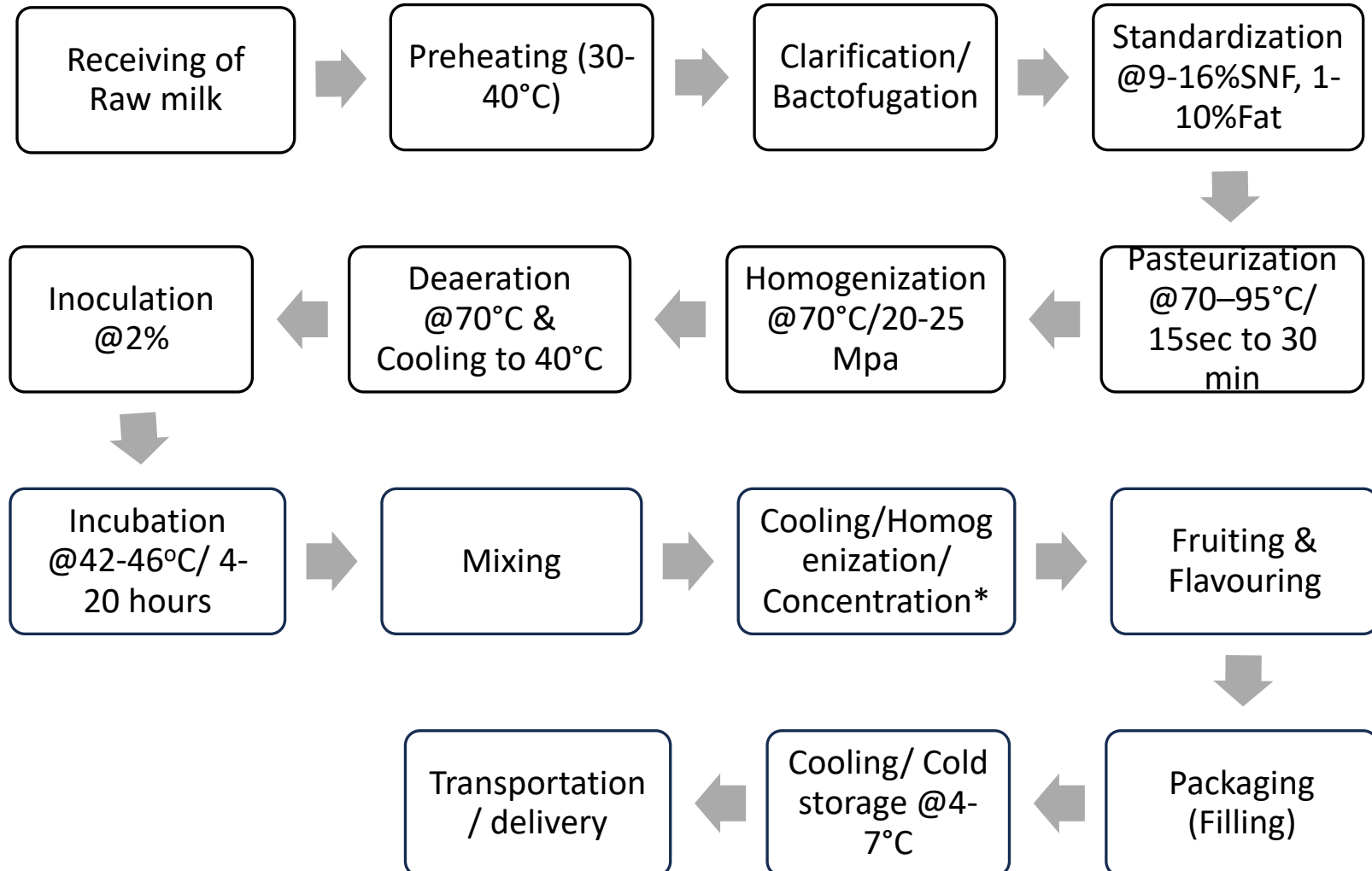
***Role of stabilizer:** Prevent syneresis (separation of whey), Increase firmness, and helps to hold the fruit uniformly. Ex: sodium alginates, pectin etc.

****Role of emulsifier:** Enhance texture, consistency, and stability. Ex: lecithin and mono- and diglycerides.

*****Role of sweetener & flavor:** Provides variety of product for consumption.



3. Processing: Process Flow Diagram



*Optional step: performed as per the type of the yogurt required.

3(a). Standardization

- A good quality yogurt requires specific composition of milk constituents.
- Done to
 1. Standardize fat content, and
 2. SNF/protein content, followed by
 3. Addition of some additives such as stabilizer, emulsifier, and sweeteners.
- Done at temperature of 40 – 55°C using standardization machine comprising of centrifuge/ separator and mixing unit.



3(b). Pasteurization & Homogenization

- Pasteurization involves in killing pathogenic microorganism, reduces number of vegetative microorganism and promote controlled fermentation.
- In addition, it denatures whey protein influencing yogurt texture and consistency.
- Followed by pasteurization, homogenization breaks down fat globules and disperse particle consistently resulting, smoother and creamier texture.
- Condition:
 1. Pasteurization: 70 – 95°C/ 15 sec to 30 min.
 2. Homogenization: 70°C/20-25 Mpa



3(c). Inoculation & Incubation

- For yogurt preparation, milk is inoculated using two strains of bacteria

1. *S. Thermophilus*
2. *L. delbrueckii subsp. Bulgaricus*

- pre-formulated inoculum having freeze-dried culture (more than 10^{10} colony-forming units (CFU)/g) standardize milk making conc. of 10^6 to 10^7 CFU/g is used.



- The mix is transported to fermentation tank or packaging machine at 2% conc. In fermentation tank, the mixture is incubated at 42-46°C/ 4-20 hours.
- This fermentation step, converts lactose to lactic acid and other metabolism producing the characteristic yogurt flavor.
- The fermentation assumed to be completed at either **at least 0.9% acidity** and **a pH of about 4.4.**

3(d). Fruiting & Flavouring

- Fruiting and flavouring done to enhance the acceptability of the yogurt amongst various consumers.
- It helps to capture the market.
- Provides large number of product range for the consumers.



3(e). Packaging (Filling)

- The packages (SKUs) used for packaging of yogurt are:
 1. Plastic bag
 2. Plastic cup
 3. Plastic bottle etc.,
- Packaging material used are LDPE, LLDPE, EVOH, MLLDPE, and other resin compounds for manufacturing of various packages.
- Packaging done at two stages,
 - First after inoculation,
 - Secondly, after flavouring and fruiting depending upon types of yogurt needs to be manufactured.



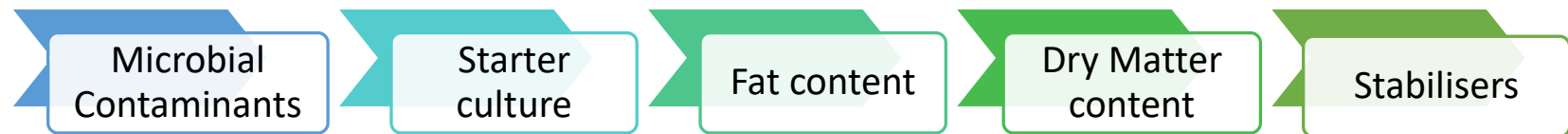
3(f). Cooling/ Cold Storing

- After packing, yogurt rapidly cooled around 4-7°C
 - to stop the fermentation process,
 - to preserve the yogurt's freshness and flavor and,
 - To ensures the yogurt's desired texture and consistency by preventing excessive fermentation or whey separation.
- Furthermore, cold storage done at a controlled temperature to ensure yogurt safety until its expiry date.

4. Quality control in yogurt processing

- Quality control programs for yogurt manufacturing involve ensuring product flavor, texture, color, process, and composition.
- Flavor defects can be caused by excessive sweetness, tartness, or atypical flavors.
- Overcooked or tart flavors can result from poor processing procedures.
- Hard-pack frozen yogurt may have
 - i. **coarse or icy texture** due to storage temperature fluctuations,
 - ii. **sandiness** due to lactose crystals,
 - iii. **soggy or gummy** defects due to high milk solids or sugar content, and
 - iv. **weak body** due to overrun and insufficient total solids.
- Proper blending of fruit purees and yogurt mix is essential for uniformity.
- Good microbiological quality of all ingredients is also crucial.

5. Factors affecting Yoghurt Quality



1. **Microbial Contaminants:** Such as Bacteriophages presence occur due to poor hygiene and lack of pest, insect and waste management.
2. **Starter culture:** The quality of yogurt depends on strain, as it produces specific desired compound in the yogurt.
3. **Fat content:** The amount of fat present in the yogurt affects mouthfeel. Higher fat% increases creaminess and smoothness.
4. **The Dry Matter content:** It affect firmness of the product, higher the dry matter content more will be the firmness.
5. **Stabilisers:** bind with water resulting increase in viscosity of the yoghurt.

6. Health Benefits

a. Reduce osteoporosis & improve bone health

b. Lowers hypertension problems

c. Excellent alternative for lactose intolerance

d. Protein rich food

e. Probiotic strains boost immunity system

f. Improves gut health



7. Recent Innovations in Yogurt

- Recent research is concentrated on creating yogurt products with extended shelf lives, improved nutrition, and new tastes.
- Goat milk yogurts and icelandic skyr strained yogurt are two of the newest fads.
- Greek yogurts with lots of protein, probiotic yogurts with minimal lactose content, and savory yogurts are also well-liked.
- In addition, Studies are also being conducted to enhance the nutritional value and shelf life of yogurts.

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