

YOGURT PRODUCTION

This page describes the production of yogurt and includes the legal Yogurt Definitions, Ingredients, Bacterial Cultures, and General Manufacturing Procedure.

Yogurt Definitions

Yogurt is a fermented milk product that contains the characteristic bacterial cultures *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. All yogurt must contain at least 8.25% solids not fat. Full fat yogurt must contain not less than 3.25% milk fat, lowfat yogurt not more than 2% milk fat, and nonfat yogurt less than 0.5% milk. The full legal definitions for yogurt, low fat yogurt and nonfat yogurt are usually specified in the Standards of Identity.

The two styles of yogurt commonly found in the grocery store are set type yogurt and swiss style yogurt. Set type yogurt is when the yogurt is packaged with the fruit on the bottom of the cup and the yogurt on top. Swiss style yogurt is when the fruit is blended into the yogurt prior to packaging.

Ingredients for yogurt

The main ingredient in yogurt is milk. The type of milk used depends on the type of yogurt – whole milk for full fat yogurt, low fat milk for low fat yogurt, and skim milk for nonfat yogurt. Other dairy ingredients are allowed in yogurt to adjust the composition, such as cream to adjust the fat content, and nonfat dry milk to adjust the solids content. The solids content of yogurt is often adjusted above the 8.25% minimum to provide a better body and texture to the finished yogurt. Stabilizers may also be used in yogurt to improve the body and texture by increasing firmness, preventing separation of the whey (syneresis), and helping to keep the fruit uniformly mixed in the yogurt. Stabilizers used in yogurt are alginates (carageenan), gelatins, gums (locust bean, guar), pectins, and starch. Sweeteners, flavors and fruit preparations are used in yogurt to provide variety to the consumer.

Bacterial Cultures

The main (starter) cultures in yogurt are *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. The function of the starter cultures is to ferment lactose (milk sugar) to produce lactic acid. The increase in lactic acid decreases pH and causes the milk to clot, or form the soft gel that is characteristic of yogurt. The fermentation of lactose also produces the flavor compounds that are characteristic of yogurt. *Lactobacillus bulgaricus* and *Streptococcus thermophilus* are the only 2 cultures required by law to be present in yogurt.

Other bacterial cultures, such as *Lactobacillus acidophilus*, *Lactobacillus subsp. casei*, and Bifido-bacteria may be added to yogurt as probiotic cultures. Probiotic cultures benefit human health by improving lactose digestion, gastrointestinal function, and stimulating the immune system.

General Yogurt Processing Steps

- Adjust Milk Composition & Blend Ingredients
- Pasteurize Milk

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- Homogenize
- Cool Milk
- Inoculate with Starter Cultures
- Hold (Fermentation)
- Cool
- Add Flavors & Fruit (Optional)
- Package

1. Adjust Milk Composition & Blend Ingredients

Milk composition may be adjusted to achieve the desired fat and solids content. Often dry milk is added to increase the amount of whey protein to provide a desirable texture. Ingredients such as stabilizers are added at this time.

2. Pasteurize Milk

The milk mixture is pasteurized at 185°F (85°C) for 30 minutes or at 203°F (95°C) for 10 minutes. A high heat treatment is used to denature the whey (serum) proteins. This allows the proteins to form a more stable gel, which prevents separation of the water during storage. The high heat treatment also further reduces the number of spoilage organisms in the milk to provide a better environment for the starter cultures to grow. Yogurt is pasteurized before the starter cultures are added to ensure that the cultures remain active in the yogurt after fermentation to act as probiotics; if the yogurt is pasteurized after fermentation the cultures will be inactivated.

3. Homogenize

The blend is homogenized (2000 to 2500 psi) to mix all ingredients thoroughly and improve yogurt consistency.

4. Cool Milk

The milk is cooled to 108°F (42°C) to bring the yogurt to the ideal growth temperature for the starter culture.

5. Inoculate with Starter Cultures

The starter cultures are mixed into the cooled milk.

6. Hold (Fermentation)

The milk is held at 108°F (42°C) until a pH 4.5 is reached and titratable acidity of about 0.91 is observed. This allows the fermentation to progress to form a soft gel and the characteristic flavor of yogurt. This process can take several hours. The chemistry behind the production of yoghurt through acidification of milk: It quantifies the changes in physical and chemical properties of yoghurt during fermentation with microbial organisms (such as *Lactobacillus bulgaricus* and *Streptococcus thermophilus*). It has been found that this symbiosis has an optimal development at a temperature of ca. 45°C with the transformation of lactose into lactic acid and small amounts of acetaldehyde, diacetyl and volatile acids. This Brief explains the chemical and physical results of the fermentation process, such as precipitation of proteins and the acid coagulation of milk with a clot formation in the final semi-

solid mass. The Brief sheds light on the accomplishments of the fermenting organisms: they are responsible for the biochemical reactions of carbohydrate metabolism, proteolysis, lipolysis and flavour production in the process of yoghurt production. It also briefly reviews formulations and food additives used in the modern yoghurt producing industry.

7. Cool

The yogurt is cooled to 7°C to stop the fermentation process.

8. Add Fruit & Flavors

Fruit and flavors are added at different steps depending on the type of yogurt. For set style yogurt the fruit is added in the bottom of the cup and then the inoculated yogurt is poured on top and the yogurt is fermented in the cup. For swiss style yogurt the fruit is blended with the fermented, cooled yogurt prior to packaging.

9. Package

The yogurt is pumped from the fermentation vat and packaged as desired.