



# The manufacture of yoghurt and cottage cheese

Dr Hamilton from Jamaica describes how perfectly acceptable yoghurt and cottage cheese can be prepared at the small scale using simple equipment. The article includes detailed methods and a short section on how to overcome basic problems in yoghurt production.

## Introduction

The small scale production of high quality yoghurt and cottage cheese is perfectly possible but does require care and an understanding of the process. While the production of good cheese and yoghurts involves a degree of art, it is based on sound scientific principles. The production of yoghurts and cheese involves a living organism and it is therefore important to understand the needs and requirements of the organisms. It is essential to pay attention to detail and accuracy in controlling temperatures and incubation times.

## Yoghurt Production

The minimum equipment required to make yoghurt is a large saucepan, a thermometer and a clean spoon for stirring. A slightly more professional approach is to use a thermostatically controlled electric yoghurt maker which incubates the organisms at their optimum temperatures. A set of scales will be required to accurately weigh out ingredients.

The science behind making yoghurt is in the culturing. Fresh milk contains a range of acid and flavour producing micro-organisms, but only two of these work together to turn milk or cream into yoghurt. These are called *Streptococcus thermophilus* and *Lactobacillus bulgaricus*.

If raw milk is kept warm, it will sour due to the growth of lactic acid forming bacteria which grow first. These compete with the two desirable strains, preventing them from growing. It is therefore necessary to start the process by pasteurising (boiling or simmering) the milk to stop or slow the growth of the undesired bacteria. Heating also removes much of the oxygen present in the milk, providing a better medium for the growth of the desired organisms.

*Streptococcus thermophilus* grows best between 45 and 47°C. *Lactobacillus bulgaricus* on the other hand, grows best between 37 and 42°C. What actually happens is that the *Streptococcus thermophilus* is the first to start growing, then as the temperature of the medium falls the *Lactobacillus* (which is responsible for the flavour) takes over.

## Methodology

While yoghurt can be made entirely from fresh milk, a richer flavoured, thicker product will result if half a cup of evaporated milk or three heaped tablespoons of powdered milk (either whole or skimmed) is added to each litre of fresh milk. The final recipe used will depend on the preferences of customers. A typical outline for yoghurt preparation involves the following steps:

- Pour one litre of fresh pasteurised, homogenized milk into a saucepan or double boiler, if available, and slowly heat with constant stirring to avoid burning, to 82–84°C. Turn off the heat and hold at that temperature for approximately five minutes. Use a thermometer that has been checked in boiling water (water boils at 100°C).
- NOTE: If UHT (Ultra Heat Treated or sterilized) milk is used it is not necessary to pasteurise but simply heat to 49°C.
- Allow the milk cool to 49°C. The cooling process can be accelerated by immersing the saucepan or double boiler in a cold water bath. At 49°C the milk is ready for the addition of the starter culture.

## Preparation of starter.

The starter consists of milk containing the two strains of actively growing yoghurt bacteria. It is either prepared from a commercially available freeze dried culture if available (5 gms/litre of milk), or one or two teaspoons of a fresh commercial plain or natural yoghurt. The milk used should be pasteurised as described above. While starters can be maintained in an actively growing state for a long time by transferring small amounts into fresh milk daily or weekly, it is much easier to save a few grams of finished yoghurt from one batch for use in the next batch.

- Mix well and dissolve the dried culture or commercial plain yoghurt in about half a cup of the warm milk, pour back into the remainder of the milk and mix well. The temperature of the milk in the saucepan will now have fallen to the desired range of 44–46°C.
- The cultured milk is then allowed to incubate in a warm place, or in an insulated box, until it sets. The time taken will depend on how active the starter culture/starter was and how well the temperature was maintained. If everything

## Keywords

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was carried out correctly, the yoghurt should set in about four hours. At this point, using a spoon that has been sterilized in boiling water, check the flavour and consistency. Note the level of acidity, flavour and texture.

- If the yoghurt has the desired flavour and texture, stop the growth of the organisms by placing in a refrigerator for a minimum of eight hours.

### Problems

Although the production of yoghurt is relatively simple, it does not always work well on the first attempt. There are several reasons for this and the following checklist (table 1) can help to rectify some of the more common problems. If you are making yoghurt for the first time, do not give up if the product falls below your expectations. Experiment with different combinations of raw ingredients and incubation times until you find a method and a product that suits your customers' needs.

### Yoghurts with fruits and flavouring

A variety of fruits and flavourings can be used to create exciting new tastes and textures in yoghurt desserts. When adding fruits or flavourings, whether the yoghurt is incubated separately or in combination with the fruit, it is important to allow it to set in a refrigerator for a minimum of eight hours.

**Fruit Yoghurt:** Use fresh, canned or frozen fruit. It can be added as slices, chopped or pureed as toppings or mixed into yoghurt.

**'Swiss Style' yoghurt:** Stir pureed fruit into yoghurt until it is a heavy cream consistency; refrigerate for 2 to 3 hours.

**Yoghurt sundaes or yoghurt parfaits:** For sundaes, put favourite fruit at the bottom of a serving dish and spoon yoghurt on top. Gar-

nish with cherries or nuts. For parfaits, layer fruit or preserves with yoghurt in a glass bowl, and again garnish with nuts, cherries and honey.

**Flavoured yoghurt:** Use flavours to create a fruit flavoured syrup, thickened with corn starch and sweetened with sugar.

### Cottage cheese

Cottage cheese is a soft, crumbly, acid cheese prepared from skimmed or partially skimmed milk or skimmed milk reconstituted from milk powder. Cottage cheese differs from other acid coagulated cheese in that the pieces of curd are kept separate by cutting, scalding and washing.

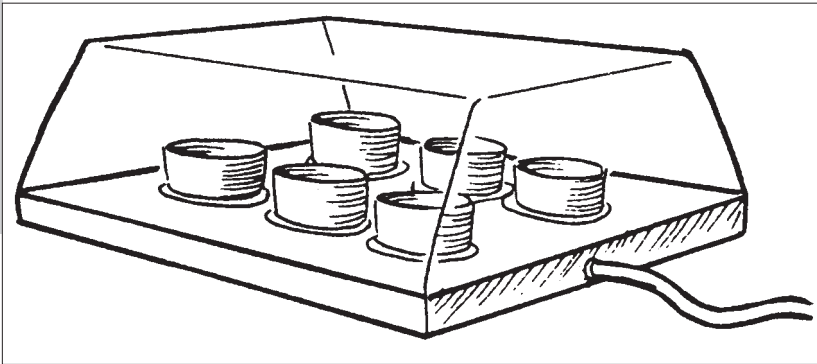
The organisms involved in the preparation of cottage cheese are a mixture of lactic acid producing *Streptococcus* and *Lactobacillus*. As with yoghurt production, the starter can be a freeze-dried culture, or, since the finished product contains living organisms, commercial cottage cheese can be used to develop a starter. When making a starter from commercial cottage cheese, the cheese should first be blended to break down the curd to a liquid and added at the rate of 5% or more to small amounts of skimmed milk. It is then incubated at 32°C for about five hours to allow the starter culture to grow.

### Two methods for making cottage cheese: the short and long set methods.

In the short set method, a small amount of rennet (an enzyme used for the coagulation of milk) is added to ensure the formation of a firm curd. The milk is first pasteurised by heating to 82–84°C, and rapidly cooling to 32–33°C. 5% starter culture is added (50ml per litre of milk) together with rennet at the rate of 0.5ml per 10 litre. The mixture is then incubated at 32°C for five hours.

**Table 1 – Common problems in yoghurt production and possible solutions**

<i>Problem</i>	<i>Remedy</i>
The yoghurt fails to set or take on the desired consistency after the normal time of incubation	a) Check the quality of the milk used. It should be fresh. b) The temperature was too high when the starter was added (over 50°C). c) The temperature of incubation was too high. Maintain temperature between 43-44°C. d) The starter was added when the milk was too cold. (Less than body temperature 37°C).
A liquid (whey) forms on the top of the yoghurt, or it has a grainy texture	a) The milk was too hot when the starter was added. b) The time of incubation was too long. c) The level or amount of starter was too high and/or it was not properly stirred into the pasteurised milk. HINT: Adding gelatin will greatly inhibit whey formation.



*A thermostatically controlled yoghurt incubator*

When using the long set method, the amount of starter is reduced to only 1–2% and the incubation temperature is reduced to 22°C, but the incubation time is increased to 12 hours. When the curd has set at the end of the incubation, a liquid (whey) will be seen on the surface.

Good results can also be obtained by adding the starter, as in the short set method at 32°C, and incubating overnight without the use of rennet.

The cheese is ready when sufficient acid has been produced. This is confirmed by the release of whey from the cheese when it is cut with a clean knife. The curd is next cut into small cubes about 8–13 mm. On a larger scale,

a special rectangular cutter made from stainless steel wire that produces regular sized pieces is used. At home, the same effect can be achieved in a bucket using a thoroughly cleaned, sterilized tennis or badminton racquet.

After cutting, the curd pieces are cooked in the whey in a double boiling pan at 49–53°C for a minimum of two hours. The scald temperature must be sufficient to control the growth of spoilage organisms.

After scalding, the curd is placed in a cheese cloth bag and allowed to drain. Finally the curd is washed three times in water at progressively lower temperatures, namely 24, 10 and 3°C.

After the final cold water wash, the curd is drained for one hour. At this point, the curd has a firm, chewy texture. Plain cottage cheese (low calorie) is produced by washing the curd in a 1–2% salt solution before packing. The product must be refrigerated at 2 to 4°C and will have a shelf life of three weeks.

Fruit and vegetable pieces may be added to the curd to produce a number of flavoured varieties, for example, onion, chives, sweet pepper and pineapple.

*by M.O. (Pat) Hamilton, Ph.D*

## **International Workshop on Drying and Improvement of Shea and Aeile**

*Ngaoundere, Cameroon*

*1–3 December 1999*

### **Objectives of the workshop**

- ◆ Review research on drying, shea and aeile
- ◆ Develop an instrument for strengthening regional collaboration
- ◆ Exchange information on research results
- ◆ Inform leaders of NGOs and policy makers about the possibilities of reducing post harvest losses

### **Expected outputs**

- ◆ Capitalisation of knowledge on drying and improvement of shea and aeile
- ◆ Determination of research priorities and strategies
- ◆ Inventory of institutions and individuals working on drying
- ◆ Publication of workshop proceedings

### **Main topics**

- ◆ Agroforestry and domestication
- ◆ Biology, plant improvement and protection
- ◆ Chemistry, biochemistry and nutrition
- ◆ Technology
- ◆ Equipment and socio-economic aspects
- ◆ Other contributions

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