SMALL SCALE YOGHURT PRODUCTION IN MONERAGALA

By

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AFFECTIIONATELY DEDICATED
TO MY
EVERLOVING PARENTS,
BROTHERS AND SISTER.

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ABSTRACT

Milk and milk products play a significant role in the food consumption of human. As the milk and milk products contains a higher nutrient value, it is used as an important food product all over the world. Small and medium scale of milk products are handled in many parts of sri lanka.

According to the statistics in 1986,the density of Cattle in Sri Lanka was about 17,83,000.The highest cattle population is available in the dry zone of Sri lanka. There are about 8,43,400 milking cows which contributes to a greater proportion of the dairy production in this country. The Moneragala district cattle population is about 49,700. The percentage is about 25.6% out of the whole Sri Lankan cattle population.

Yoghurt, ice cream, milk toffees and other confectionery products are produced as milk products in the rural sectors of moneragala. Specially yoghurt is the most popular milk product in this area.

The cost of producing yoghurt is also very low when comparing with other milk products. On the other hand, no need of high technology to produce yoghurt.Who don't have much knowledge on milk products also can try to produce yoghurt in small scale in household.

Here the SANASA plays a key role among the peasants of Moneragala to improve their living standard through its invaluable services. SANASA provide credit facilities and other important contributions by there service to encourage the farmers, who have keen interest on the milk products.

The people in the district of Moneragala are able to reach their goals, with the help of the SANASA programme.

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CHAPTER I

INTRODUCTION

Today the subject milk and milk products has become highly important. It is sad to note that there is no proper attention in the dairy field regarding dairy production. The problems faced by the formers should be properly noticed and attend to overcome the constraints in dairy development.

Today the import of milk and milk products is in the range of 40,000 - 42,000 MT per annum. 80% of the milk consumed locally is being imported. In 1986 this figure was only 50% . Recent studies has shown that the local milk production even after implementation of the project for a period about 7 years, will meet only about 14%-15% of the total demand. Therefore the local production will decline further unless the present level of support to the farmer is enhanced.

In a workshop held recently on "Development of dairy industries in Sri Lanka" in february this year, participated the representatives of producers, collectors, processors and marketers of milk. In this lack of profit margins, non availability of breeding stock and shortage of feed was identified as serious constraints to the dairy industry.

There are commercial forms for all types of livestock, except in the case of dairy cattle, dairying in Sri Lanka is under taken as a source of supplementary income. Dairying must compete for investment funds for its development. The lack of experience, interest and training in animal husbandry will lead to it's decline.

Milk is a highly perishable commodity, unless it is treated or processed to prolong it's life it gets spoiled and there after will not be of any use.Processing is any activity or method, which is carried out to extend the " shelf life" of the milk. It is achieved by treating with chemicals or cooling or heating the milk. At homes the milk will be immediately heated

this is done to kill undesirable micro organisms in the milk and thus to extend the life span of milk. When the milk is more than the daily requirement, the excess is turned in to curd, another method to extend the life by few more hours. Similar to heating,
by chilling the milk also it's life span could be extended. By this only bacterial activity is reduced. But the bacteria will not be killed. When milk in excess, collected by processors and chilled before they are transported to the factories. Where the liquid fresh milk is converted in to pasteurised / sterilised/ flavoured liquid milk and or in to other products like Yoghurt, Ice cream, Cheese, Milk powder etc. The life span of these products varies from days to several months.

The processing we are going to practise is important. It is difficult to even estimate the processing capacities available at individual farmers in house hold level and of those producing curd and yoghurt, as home industry.

SANASA is a voluntary organization set up for the purpose of promoting thrift and credit among members as well as promoting collective efforts in community development activities among them. It is open to all, who prepared to faster self reliance, and for collective responsibility and for dedicated working for the common good of those joined with "SANASA". The objectives of thrift and credit co-operative moment is as follows.

* To promote economic development of the members in particular and the larger section of the community in general by inculcating thrift and credit habits.
* To organize and act as sales agents for the members.
* To provide credit facilities at reasonable interest rates on production activities for the members.
* To organize and act as sales agents for the members in the marketing of their products and to provide inputs required for such production.
* To make all efforts to attain a society based on cooperative principles.

Youth programmes

Several projects and programmes those specially attract the attention of youth of both sexes are being implemented under the youth programme of the sanasa movement. Programmes direct towards assessing youth talent and efficiency are being organized bi annually and annually. sanasa statics show that youth comprise 35% of the total membership of the sanasa in Moneragala district.

Low income group programmes

Specific programmes for the benefit of the low income groups offering low interest loan schemes etc are being implemented under the sanasa movement. In the moneragala district about 75% of the membership are from the low income groups and about 65% loans issued have been direct such low income group members.

Sanasa women's programme

The Sanasa movement has a women's programme where women can reach even up to the national level schemes from primary society level through its loan and credit operations. The Sanasa women's committee is structured as follows.

National women's committee

National women's steering committee

District women's committee

Zonal women's committee

Cluster women's committee

Primary women's committee

Membership eligibility

The following are the basic qualifications of a member who wishes to join the Sanasa society.

* The persons must not be below 18 years of age.
* The persons must be a permanent resident of the area of authority.
* He/She should be a person of good character.
* The person should not be a member of another unlimited society.
* He/She should be a member of a social mobilizer group.

Education and training

Once the social mobilizer groups have been formed into Sanasa societies the officials and members will have to be given continuous training in Leadership, Management, Accounts keeping, co-operative principles and in aims and objectives of the specific subject involved. It has been planned to give this training at primary,zonal, district and society levels and this training programmes will be held often, according to the needs of the primary societies.

The main purpose and objectives of the educational programme would be to get the new societies involved with Sanasa movement and try to extract the qualities and capacities of the members along with their aspirations and have them surfaced for achieving project objectives. The monthly review sessions will be conducted by sanasa, project officers and divisional secretaires at divisional secretariats review the progress of the training programmes.

CHAPTER 11

LITERATURE REVIEW

2.1 Definition for milk

Milk is a white fluid secreted by female mammals for the purpose of rearing their offspring. Milk has been defined in a number of ways by different workers.

Milk has been defined as the entire product of the complete and uninterrupted milking of milch cows which are properly cared for and are in good health.

Geneva congress has defined it as, "The integral product of product of entire and uninterrupted milking of the female milch cow in good health and well nourished and not over worked. It aught to be collected in proper manner and contain no colostrum."

Federal definition of USA is "Milk is the fresh, clean lacteal secretion obtained by the complete milking of one or more healthy cows.. properly fed and kept. Excluding that obtained with in fifteen days before after calving and containing less than 8.5 percent solids not than 3.25 per cent milk fat'.

There are two important things about these definitions.

* Secretion of cows udder and apart from this
* Freaks milks should be avoided either by mentioning the condition of the cow udder and method of milking or by laying compositional limits (1).

2.2 Secretion of milk

The secretion of milk from mammary glands occurs usually after the young ones are born. Before the birth of the young ones the blood is used for the nutrition of the foetus. But after the birth the some blood is directed towards udder and the blood vessels and capillaries in the udder swell.

The secretion of milk is controlled by the activity and development of the sexual organs. Before the parturition ovarian hormone is secreted in good amount which depresses the secretion of lactogenic hormone. But after the Birth of the calf, ovarian hormone decreases and lactogenic hormone increased due to which lactation commences.

A calf needs about 1000 liters of milk for growth and that is the quantity which the primitive cow produces for each calf. There has been an enormous change since man took the cow into his service. Selective breeding has resulted in dairy cows which yield more than 5000 litres of milk per calf.. i.e. five times as much asthe primitive cow. Somecows can yield10,000 litresor more.

Before a cow can start to produce milk she must be serviced and drop a calf. Heifers reach sexual maturity, at the age of seven or eight months but are not usually serviced until they are 15 - 18 months old. The period of gestation is 265 - 300 days. Varying some what according to the breed of cow ,so a heifer produces her first calf at the age of about two and half years (2).

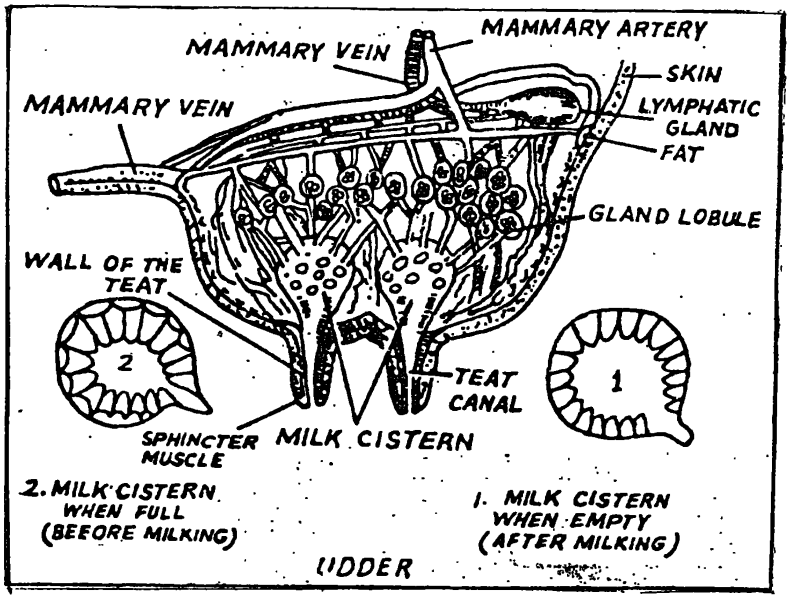


Figure 2.1: Detailed sectional view of the udder

(Source: Dairy Chemistry and Animal Nutrition 1980)

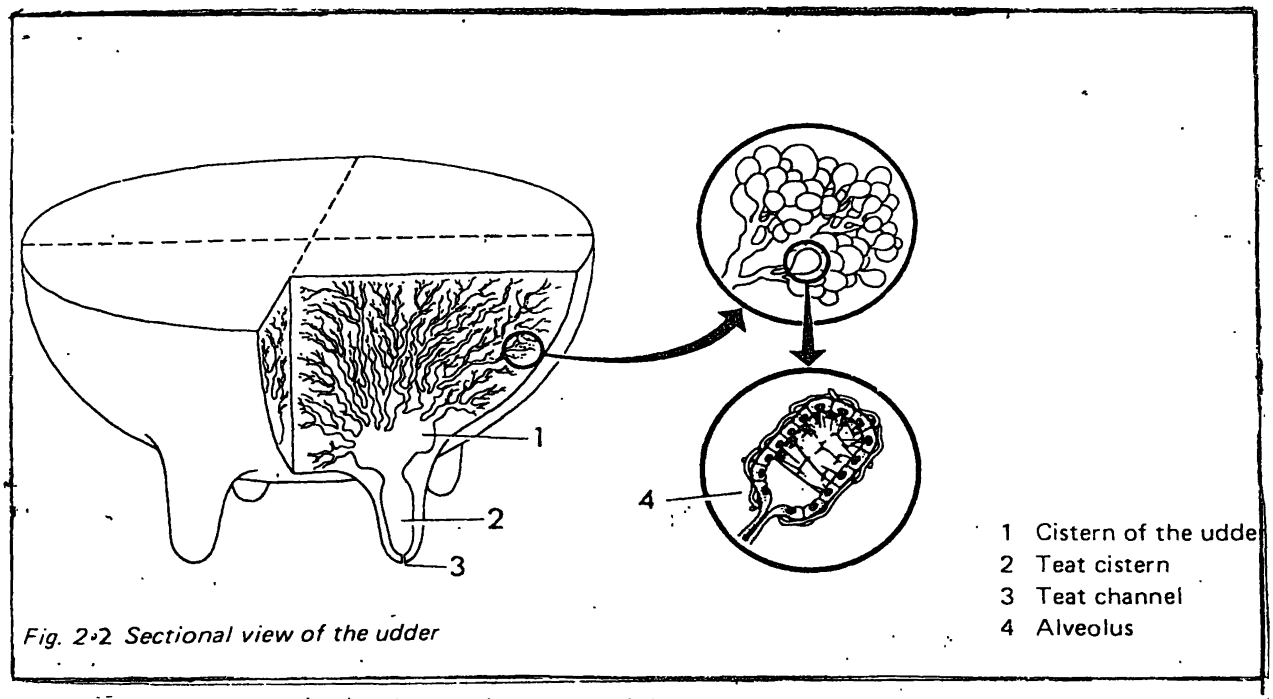


Fig. 2-2 Sectional view of the udder

Figure 2.2. Sectional view of the udder

(Source: Dairy hand book 1986)

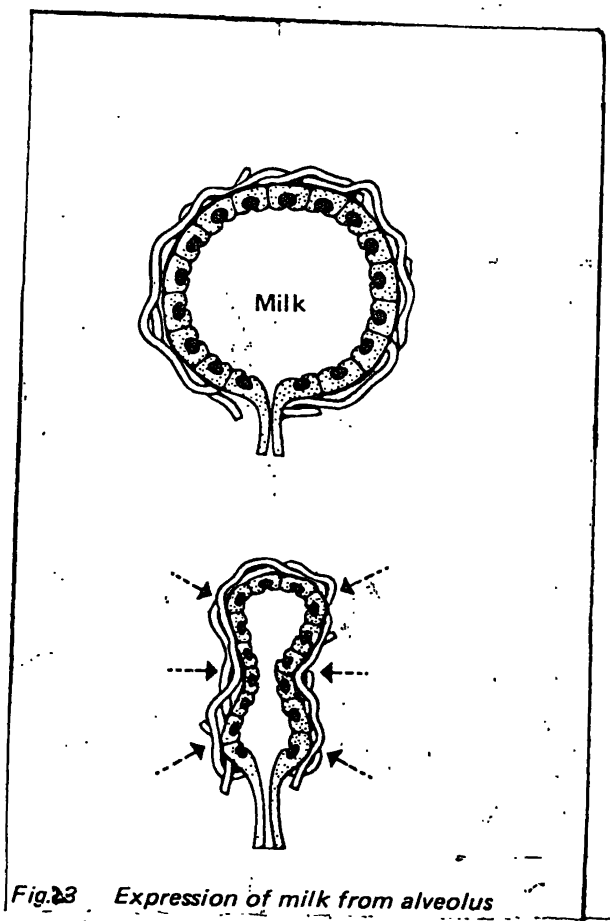


Fig. 2-3 Expression of milk from alveolus

Figure 2.3. Expression of milk from alveolus

(Source: Dairy hand book 1986)

2.3 The lactation cycle

Secretion of milk in the cows udder begin shortly before calving, so that calf can begin to feed almost immediately after birth. The cow then continues to give milk for about 300 days. This period is known as a lactation.

The cow normally comes into heat again month or two after calving and thereafter at intervals of 3 weeds. Some time after calving the cow is serviced again. As the foetus grows in the cow. It demands more and more nourishment. So the amount of milk produced grows progressively smaller toward the end of lactation.

Six to nine weeks before the new calf born milking is gradually tapered off. The cow dries up, with the birth of the calf a new lactation cycle begins.

A cow can normally be expected to remain productive for about 5 years. Milk yield is somewhat smaller in the early lactations and a cow does not reach the peak of her production until the third lactation (2).

2.4 Constituents of milk

Milk is a mixtures per excellence raw milk when kept at ordinary temperature separates in to three obvious constituents.

1. Fat globules which form the cream layer and being lighter rise to the surface
2. Curd
3. Whey

Curd and whey appear when milk sours. Milk is also considered to be a mixture of three constituents in the following manner.

1.Water

2.Fat

3.Solids-not-fat

If asked to analyze an average sample of milk and determine the chief constituents. A chemist would report approximately as follows (2).

Table 2.1 : Chief constituents of milk

Constituents	Percentage
Water	87.25
Dry matter	12.75
Fat	3.80
Protein	3.50
Sugar	4.80
Ash	0.65
Total	100.00

(Source:Clarence, Willes and Herold, 1993).

2.4.1 Milk fat

If milk is left to stand a layer of cream will form on the surface. The cream differs considerably in appearance from the bottom layer of skim milk. Under the microscope, cream can be seen to consist of a large quantity of spheres of varying sizes floating freely in the milk, each sphere is surrounded by a thin skin.

These tiny spheres are fat globules, and the skin consist of protein (mucous, membrane) and phospholipids. As we shall see later: The skin has an important function. It protects the fat from being broken down by enzymes present in the milk.
The fat globules are the largest particles in milk. Their diameter range from 0.1 to 20 mm. The average size is 3 -4 mm and there are 3000 - 4000 million fat globules in a milliliter of whole milk (3).

2.5 Chemical structure of milk fat

All fats belong to group of chemical substances called esters. Which are compounds of alcohols and acids. Milk fat is a mixture of different fatty acid esters called triglycerides, Which are compounds of an alcohol called glycerol and various fatty acids. Fatty acids make up about 90% of milk fat.

A fatty acid molecule is a compound of hydrocarbon chain and a carboxyl group. In saturated fatty acids, the carbon atoms are linked together in a chain by single bonds. While in unsaturated fatty acids there are one or more double bonds in the hydrocarbon chain. each glycerol molecule can bind three fatty acid molecules. and since the three need not necessarily be of the same kind, the number of different glyceride in milk is very large (2).

2.5.1 Proteins in milk

Proteins are an essential part of our diet. the proteins we eat are broken down into simpler compounds in the digestive system and in the liver and these compound are then conveyed to the cells of the body where they are used as construction material for the body's own proteins. The great majority of the chemical reaction that occur in living organisms are controlled by proteins.

Proteins are giant molecules built up of smaller units called amino acids. A protein molecules consist of chain containing in some cases. Thousands of amino acids linked together in a specific order.

MILK PROTEINS

* Casein
* Albumin
* Globulin
* Membrane proteins

Same 25 different amino acids are known to occur in milk proteins. Among them are all the essential amino acids that the human body must have in order to function. Milk proteins are generally divided in to four main classes casein , globulin , albumin and membrane proteins (3).

2.5.2 Enzymes in milk

Enzymes are a group of proteins produced by living organisms. They have the ability to trigger chemical reactions and to influence the course and speed of such reaction.

The enzymes in milk come either from the cows udder or from

bacteria. The former are normal constituents of milk and are called original enzymes. The latter bacterial enzymes vary in type and abundance according to the nature and size of the bacterial population. Several of the enzymes in milk are utilized for quality testing and control. Among the more important ones are peroxidase, catalase, phosphates and lipase (3).

2.5.3 Vitamins in milk

Vitamins are organic substance which occur in very small concentration in both plants and animals. Milk contains many vitamins.The best known are A , B1 , B2 , C and D vitamins. A and D are soluble in water (2).

2.5.4 Minerals or salts in milk

The most important salts are those of Calcium , Sodium , Potassium and Magnesium. which occur as Phosphates, Chlorides; Citrates and Caseinates. Potassium and Calcium salts are the most abundant in normal milk. The amount salts present are not however constant.

Towards the end of lacation and even more so in case of udder diseases. The Sodium chloride content increases and gives the milk a salty taste. while the amounts of other salts are

correspondingly reduced (2).

2.5.5 Other constituents of milk

Milk always contains leucocytes. The content is low in milk from a healthy udder. But increases if udder is diseased usually in proportion to the severity of the disease. Milk usually also contains dissolved gases. (5 - 9% by volume) these consist for the most part of carbon dioxide, nitrogen and oxygen (2).
But changes in milk and its constituents as following reasons.

* During storage
* Oxidation of fat
* Oxidation of protein
* Lypolysis
* Effects of heat treatment (2).

2.6 Physical properties of milk

We can consider following properties;

* **Appearance**
  The colour varies from white to yellow. according to the coloration of the fat. skim milk is more transparent with a slight bluishtings.
* **Density**
  The of milk normally varies between 1.028 and 1.034 depending on composition milk is thus very slightly denser than water.
* **Freezing water**
  The freezing point of milk varies between -0.54 and -0.59 °c depending on the content lactose, proteins and minerals. Presence of these substance in water lowers the freezing point. A higher concentration would make the freezing point even lower.

  Boiling point of milk varies between 100.15 and 100.17 C. it's also depending on above the freezing point reasons (2).
* **pH**
  Normal milk is very slightly acid with a pH of 6.6 - 6.7
* **Taste**
  Slightly sweet taste gives from normal milk (3).

2.7 Cultured milk production

Cultured milk is the collective name for products such as Yoghurt, Ymer, Kefir, Cultured butter milk, Scandinavian sour milk and Scandinavian sour cream etc. The generic name of cultured milk is derived from the fact that the milk destined for the product is inoculated with a starter culture which

converts part of the lactase to lactic acid carbon dioxide, acetic acid, diacetyl, acetaldehyde and several other substances are farmed in the conversion process, and these impart to the products their characteristic fresh taste and aroma.

In the production of cultured milk, the best possible growth conditions must be created for the starter culture. This is achieved by heat treatment of the milk. so that any competing micro - organisms will be inhibited. In addition, the milk must be maintained at the optimum temperature for the relevant starter culture. When the best possible taste and aroma have been achieved, the cultured milk must be cooled quickly in order to stop the fermentation process. an excessively long or short fermentation time will give rise to impaired taste and incorrect consistency.

In addition to good taste and aroma,the correct appearance and consistency are important features of cultured milk (3).

2.7 Starter culture

Bacterial cultures,known as starters, are used in the manufacture of cultured milk products. The starter is added to product, and allowed to grow there under controlled conditions. In the course of the resulting fermentation the bacteria produce substances which give the cultured product its characteristic properties such as pH , flavour, aroma and consistency.

Table 2.2: **Some bacteria used in starter culture for cultured milk products.**

BACTERIUM	EFFECT	PRODUCT
Propionic bacterium Propionic shermani	Flavour/ Aroma eye formation.	Emmenthal cheese
L. bulgaricus	Acidity	Yoghurt, Kefir
L. lactose L. helveticus	Flavour/ Aroma	Emmenthal cheese
L. acidophilus	Acidity	Acidophilus butter milk
Str. thermophilus	Acidity	Yoghurt, cheddar Emmenthal cheese
Str. diacetilactis	Acidity, flavour, Aroma	Butter, Sour cream, Butter milk
Str. lactis Str. cremoris	Acidity	cheese, Sourcream Acid butter milk

Source: Dairy Hand Book, cited by Alfa Larval, 1986)

Since cultured dairy product have different characteristics,

different starter cultures are used in their manufactur .
We can considered one of the cultured milk product (.

2.9 Yoghurt

Of all cultured milk products, Yoghurt is the best known and most popular in almost all concern of the world. The highest consumption of Yoghurt is in countries around the world. The highest consumption of Yoghurt is in countries around the mediterranean, in Asian central Europe.

The consistency, taste and aroma vary form one district to the next. In certain areas,Yoghurt is produced in the form of a highly viscous liquid. Where as in other countries it is in the form of a softer gel. Yoghurt is also produced in frozen form as a dessert, or a drink. The taste and aroma of Yoghurt differ from these of other acidulated products, and the volatile aromatic substances include small quantities of acetic acid and acetaldehyde.

Yoghurt is usually classified in to two types.

* Set Yoghurt : Which is packed immediately after inoculation with bulk starter and is inoculated in the packages.
* Stirred Yoghurt : which is inoculated in a tank. After incubation the product is cooled before packaging (3).

2.9.1 Flavoured Yoghurt

Yoghurt with various flavouring and aroma additives is very popular, although the trend back towards natural Yoghurt is clearly discernible on certain markets. Common additives are fruit and berries, in syrup, processed or pure form. The proportion of fruit is usually about 15%. Yoghurt is some times also flavoured with various essence, such as vanilla, coffee, etc. Colouring and sugar in the form of sucrose or glucose are also sometimes added together with the flavouring. In addition, stabilizers are added in order to modify the consistency (3).

2.9.2 Factors Affecting Yoghurt Quality

Numerous variables must be controlled accurately during the manufacturing process. If a high quality Yoghurt is to be produced, with the required taste, aroma, viscosity, consistency, appearance, freedom from whey separation and long shelf life. Most of these factors are closely related to the choice and pretreatment of the milk and to the preparation of the culture. The factors include

* **Milk standardization**
* **Milk additives designed to improve the viscosity and texture.**
* **Homogenization**
* **Heat treatment**
* **Culture preparation**

The purely mechanical treatment to which Yoghurt is subjected during production also has an effect on quality.The design of the process line is therefore very important from the quality aspect. Regardless of whether set or stirred Yoghurt is to be produced. Pre-treatment of the milk and culture preparation are the same.(3)

* **Pre-treatment of milk**

* **Choice of raw material**

Milk used for Yoghurt production must

- Have a law bacteria count
- Not contain enzymes and chemical substance which may impede the development of the Yoghurt culture.
- Not contain penicillin and bacteriophages.

* **Standardization of the milk**

*** Milk additives**

Stabilizers and sweeteners may be used as additives in Yoghurt production. Vitamins, usually vitamin C, are sometimes also added.

Stabilizers used in Yoghurt are,

- Gelatin
- Pectin
- Agar agar

Sweeteners in the frozen of sucrose or glucose are added in the production of fruit Yoghurt at the rate of about 7% to 15% . The fruit then usually contains about 50% sugar. Small Quantities of sweetener can also be added in the production of natural Yoghurt.

*** Homogenization**

The stability and consistency of Yoghurt are improved by the milk being homogenized. the firmness of the gel increases with increasing homogenizing pressure provided that all of the milk is treated. Yoghurt milk should be homogenized at about 20 MPa and a temperature of 55-70 ^{o}C.

Apart from improving the stability and consistency homogenizing also imparts more body to the Yoghurt. This is due to the fact that fat is prevented from separating out.

*** Heat treatment**

The milk is heat treated before being inoculated with starter in order to

1. Improve the properties of the milk as a substrate for the bacteria of the bulk starter.
2. Ensure that the coagulum of finished yoghurt will be firm.
3. Reduced the whey separation in the finished product.

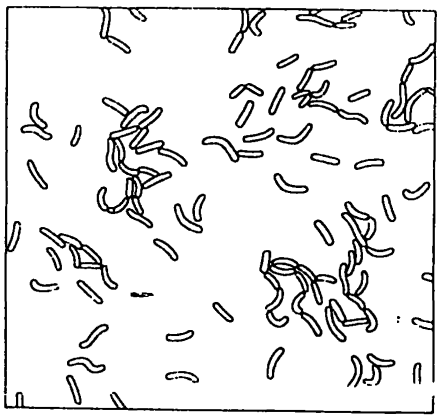
Optimum results are achieved by heat treatment of the milk at 90°C - 95°C and holding time of 5 minutes. They whey proteins are denaturated and consequently contribute to the stability of the "yoghurt body".(3)

2.9.3 Preparation of the culture

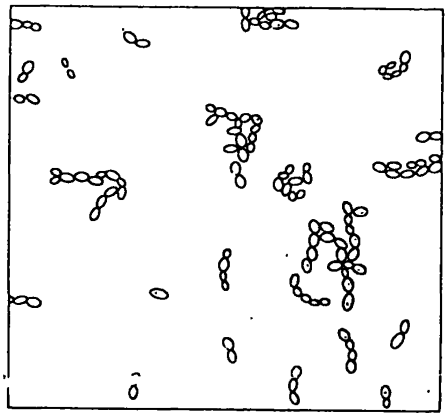
The preparation of the starter culture in the production of Yoghurt demands maximum accuracy and hygiene. The aseptic process lines described in the chapter entitled starter culture are generally used in production.

The bacteria used are strains of the;

* Streptococcus thermophilus
* Lactobacillus bulgaricus



Lactobacillus bulgaricus



Streptococcus thermophilus

Figure 2.8: Bacteria in Yoghurt
(Source: Alfa larval A. B., 1986)

The culture used for Yoghurt originally also contained other types of lactose fermenting organisms, although such cultures are now considered as contaminated.

The ratio of Cocci to Bacilli in the culture and in the Yoghurt is usually about 1:1 or 2:1, However the balance can easily be disturbed unless all variables such as inoculation quantities, times and temperatures, are kept under close control. The cultures must be replaced at regular intervals, since repeated transfer will alter the ratio Lactobacillus bulgaricus will then often dominate, and this will lead to sharp taste by excessive acid and acetaldehyde being formed. Aseptic production of the culture can for example be infected by spore forming bacteria. These are heat resistant types which often survive the heat treatment of the milk. They impart a bitter taste and aroma to the Yoghurt.

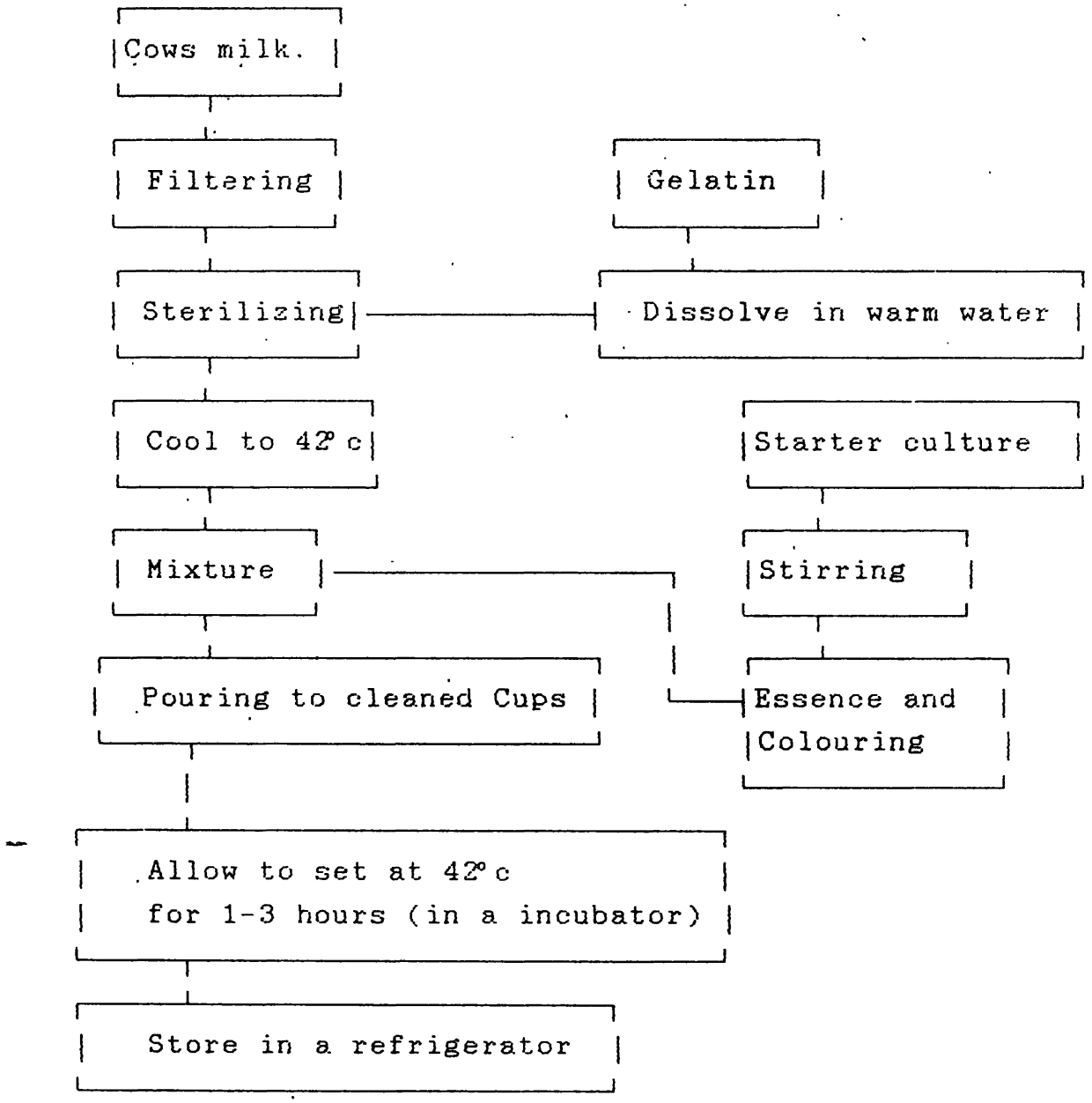
Immediately after production, Yoghurt should have and acid content between 0.9 and 10%. the content may then increase to 1.5% during distribution. The pH is between 4.4 and 4.2 ,although values as law as 4.0 are not unknown.The acid content can be regulated by
accurately controlled incubation of the culture with Lactobacillus bulgaricus and Streptococcus thermophilus and by rapid cooling of the product at the optimum pH. A high acid content is usually accompanied by higher contents of aromatic and flavouring substances (3).

CHAPTER III

MATERIALS AND METHODS

SANASA was selected to observe some small scale producers because SANASA is a operation centre for some of the milk and other confectionary products in this area specially in Yoghurt. The places were observed under the instruction of SANASA, which produces Yoghurt in this area. Two places were selected to observed. One place is situated in Sirigala, and other place was situated in Kataragama.

The process of the Yoghurt production in Moneragala area can be represented in this way by a flow diagram.



Yoghurt production in Sirigala;

They are small scale producers. 500 cups of Yoghurt per day were produced by them.

Ingredients

* Cows milk - 06 bottles
* sugar - 540 g.
* Gelatin - about 25 g.
* Hot water - 1,1/2 cups
* Fresh Yoghurt - 2 cups

egg yellow, colouring and vanilla in small quantities

Equipments

* Saucepan
* Spoons
* Heat source (wood cocker)
* Small basin
* Glass box with w bulbs (as a incubator)
* Cleaned plastic cups

Procedure

Six bottles of cows milk were boiled up to 100c . The milk was filtered twice.

540 g of sugar was added into the milk and was heated again.

It is allowed to cool about 40-45c.

Gelatin was previously dissolved. Egg yellow and vanilla essence were added in to the milk.

Two cups of Yoghurt starter culture were added to the milk at about 40-45°c temperature.

It was stirred well by a spoon.

Cleaned plastic cups were filled with that milk upto about 3\4 level.

Then cups were incubated at about 40°c in a glass box (incubator) until milk become harden.

The cups were stored in a refrigerator at about 4°c .

** Incubator facilities were not available. A glass box with fixed 60W bulbs was used as an incubator. Two Frieshien cows were available for milking.

Transport facilities were poor. They transported their product to the market in small bags travelling on foot. Thus they had not good education and production knowledge. They had done it with
experience. They didn't follow health protection in the production systematically. Therefore, the quality was not in high level.

The Yoghurt production in Kataragama

They are also small scale Yoghurt producers, they have invested money to produce Yoghurt with the help of SANASA. About 550 cups of Yoghurt per day were given the market.

Ingredients

* Cows milk - 7 bottle
* Sugar - 700 g
* Colouring(egg yellow) - 1/2 spoon
* Essence(Vanilla) - 3 teaspoons
* Fresh Yoghurt - 2 cups
  (as a starter culture)
* Gelatin - 3,1/2 table spoon

Equipments

* Saucepan
* Spoons
* Heat source
* Basin
* Regiform box with 60W bulbs (as a incubator)
* Cleaned plastic cups

Procedure

Seven Bottles of cows milk were filtered twice. Then milk was boiled up to 100°c .

Added 700g of sugar in to the milk and it was heated again.

One teaspoon of milk powder also added to the mixture allowed the mixture to cool for about 42°c .

Then previously dissolved gelatin, egg yellow, and vanilla essence were added into the milk.

Two cups of Yoghurt starter culture were added to the milk mixture at 42°c and it was stirred well by a spoon. Then cleaned plastic cups were filled with that mixture up to about 3\4 level.

The cups with mixture were incubated at 42°c in a regiform box

until milk become harder with in 3-4 hours.

Then the cups were stored in a refrigerator at about 4°c .

** They also don't have a good incubator, therefore they were using a regiform box with a 60W bulbs as an incubator. They take cows milk from a small scale milk producer in that area. But they have better transport facilities when comparing with sirigala.

They transported their Yoghurt to the market by a three wheeler. They packed the cups of Yoghurt in regiform boxes and distribute. But preparation place was not hygienical.

They used fresh Yoghurt which was in the market as a starter culture. They were not concerning the expiry date of the fresh Yoghurt. Sometimes they used expired Yoghurt as a starter culture. Therefore the quality couldn't assumed. The Kataragama producers also not had a good educational and a production knowledge. Therefore they had to envisage various types of problems during the production in the period of start.

CHAPTER IV

DISCUSSION

The percentage of water in the milk plays a significant role in the production of Yoghurt.

The structure, consistency and the hardness of Yoghurt, mainly depend on the content of water in the milk. The quality of Yoghurt would be high and genuine When the milk contains less amount of water content.

The structure of the Yoghurt would be soft When the milk contains a higher percentage of water. The water in the milk should be evaporated as possible to get good quality Yoghurt.

Care should be taken when adding the starter culture. The starter culture mainly contains a number of micro-organisms. The appropriate temperature for the inducement of Lactobacillus bulgaricus and Streptococcus thermophilus is between 40c - 45 °c . The activity of bacterial cell is affected when the temperature reduces or increases than that certain level. The time of incubation and the temperature of incubation should be maintained in proper manner. The time of incubation should be at about 2-3 hours of period and the temperature should be at 45c .

The Yoghurt is incubated at room temperature in small scale industries and there by the structure of Yoghurt is quite, soft,than that of incubated in the incubator at 45 °c

Adding colouring flavours and sugar must be in a proper

level. Otherwise, it is possible to appear a undesirable colour and taste.

After the incubation the growth and the activity of the bacteria should be minimized, If not the sour taste is increased.

The fat content in the milk should be separated as far as possible, when the fat content increases, there is a gap and spilt on the surface of cream layer.

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