

# 13 Food preservation



## 13.1 Need of food preservation

Food spoils mainly due to the growth and action of microorganisms on food.

e.g.:- Coagulation of milk, growth of mould on bread, spoilage of fish, coconut oil going rancid



Figure 13.1 ▲ Fresh food and spoiled food

In addition to the microbial activity food is also spoilt by the damage caused by macroorganisms such as weevils and grain borers growing on food.

e.g.:- Weevils spoiling cereals and pulses such as paddy, gram and green gram

Food, especially vegetables, fruits and cereals become unsuitable for consumption due to not following the correct technological methods during processing them. From harvesting to market they are subjected to bruises, cuts, lacerations, squashes and bumps. Therefore, such food becomes unconsumable. As microorganisms readily act on such damaged food, they spoil fast.

Natural changes in food occur because of the action of various chemical substances such as enzymes present in them. It is called self degradation.

**e.g.:- Maturation, ripening and putrefaction of fruits**

Different methods are applied to preserve food, and it will help to fulfill the nutrient requirements of man.

**The process of making food stay longer by artificially controlling the factors affecting food spoilage is called food preservation.**

Hence, during the food preservation attempts are made to preserve the nutritional value and other characteristics of the food item.

Reduction of food spoilage, prevention of food poisoning, usage of excess food processing them to be used in off seasons are the aims of food preservation.

Let us engage in Activity 13.1 to distinguish preserved food from several food types.



### Activity 13.1

**You will need:-** Cow milk, rice, fresh fish, a bottle of sterilized milk ('kalkiri'), a packet of dried sprats, dried jak fruit ('atucos'), limepickle ('lunudehi'), dried fish



Figure 13.2 ▲

#### Method:-

- Keep the samples of food provided to you exposed to air.
- Observe the colour and texture of those samples everyday for about a week under the guidance of your teacher.
- Tabulate your observations as follows.

Table 13.1

Food type	Observation

From the observations it is clear that in food items such as cow milk and fresh fish, the properties like colour, odour and texture change within a few hours.

But it can be seen that in sealed bottled milk ('kalkiri'), 'atukos', dried fish, 'lunudehi' and dried sprats no observable change in properties such as colour, odour and texture have taken place. It is because those food items are preserved.

## 13.2 Food preservation methods

In order to preserve food, mainly the factors causing food spoilage should be controlled. Some measures that can be taken are as follows.

- Preventing microorganisms getting to the food
- Controlling the temperature and water content to minimize the microbial activity on food
- Prevention of damage caused by macroorganisms

There are modern methods as well as traditional methods for food preservation.

### Traditional methods of food preservation

From the distant past humans have adopted various methods to preserve food. Even today they are used with minor changes.



#### Assignment 13.1

- Collect information about the traditional methods used to preserve food.
- List traditional methods you discovered and provide examples for each of them separately.

Some traditional methods used to preserve food and examples for them are given in Figure 13.3.

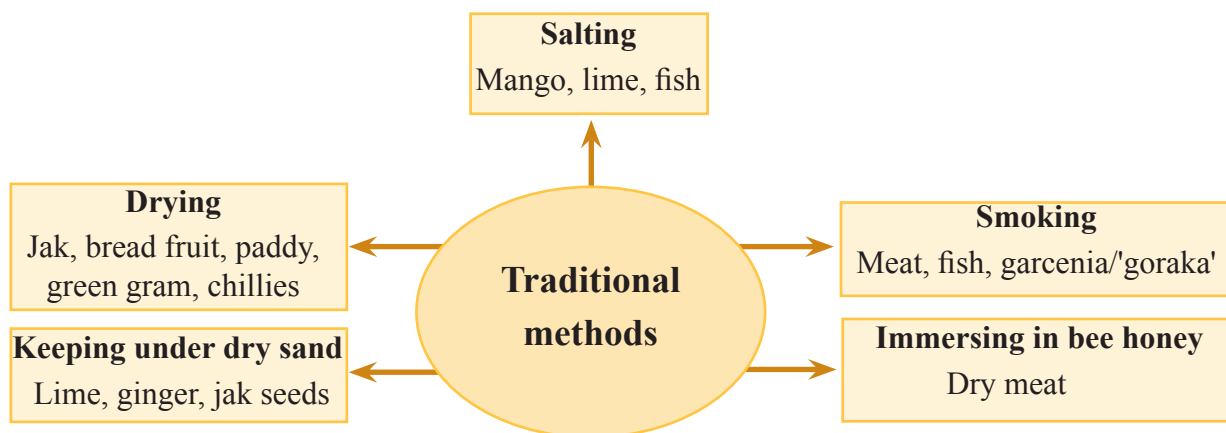


Figure 13.3 ▲



Salting - mango



Smoking - fish

Figure 13.4 ▲



## Assignment 13.2

- Collect information about the modern methods used to preserve food.
- Along with examples present how those methods help to preserve food.

## Modern methods of food preservation

Given below are modern methods used to preserve food and some examples for each of the method.

### • Drying

#### Drying by sun's heat

Unlike in the past, at present the solar heat drier is used to dry food (Figure 13.5). Since a closed condition prevails within the drier more pure and dry food can be obtained within a shorter period of time. Mixing of wastes, damages caused by animals and rain can also be prevented by this.

This method can be used to preserve food items such as chillies, fruits, vegetables etc.

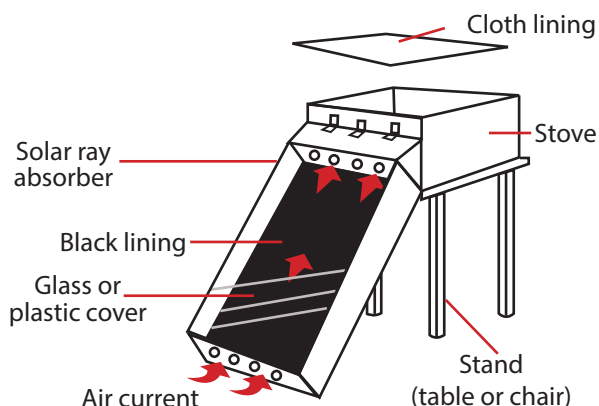


Figure 13.5 ▲ Drying food using a solar heat drier

## Stove drying

Ability to give the appropriate temperature for the food that is dried is an advantage of this method. Stoves which use electricity, gas and mineral oil are used for drying food.

This method can be used to preserve food items such as chillies, fruits, mushrooms etc.



Figure 13.6 ▲ A stove drying food

## Spray drying

When water is removed milk becomes dry powder. Hot milk is sprayed onto a heated cylinder with high pressure. Therefore, microorganisms do not grow.



Figure 13.7 ▲ A machine producing milk powder

- **Temperature control**

A favourable temperature (40 °C) is essential for the growth of microorganisms. The growth of microorganisms could be controlled by reducing the temperature to a value that is unfavourable for their growth.

## Freezing

The temperature of the food material is kept at a low value than the surrounding temperature. It is important to maintain the temperature of ordinary freezing chambers always below 4 °C.

## Deep freezing

The temperature below -18 °C prevailing in deep freezers is adequate to prevent the growth of most microorganisms. By deep freezing the natural colour, taste and nutritive value of food can be protected to a large extent.

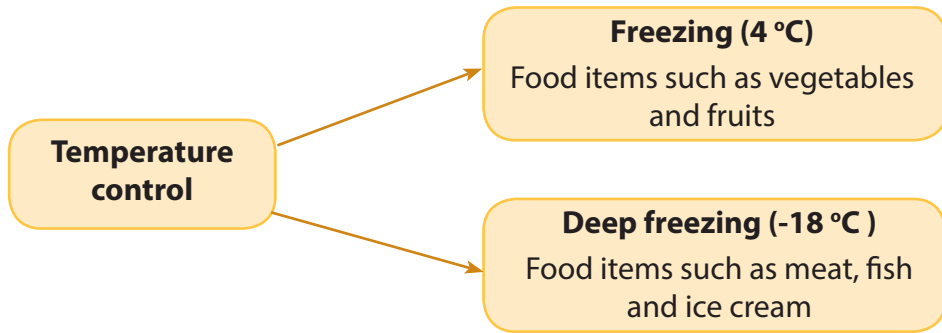


Figure 13.8 ▲ Domestic method of preserving food by controlling temperature



### Assignment 13.3

- State some food types that can be preserved by keeping in a refrigerator.
- Make a list of food that should be kept in a deep freezer for preservation.

#### ● Concentration

In canning and bottling, water in food is removed. Hence, the concentration of the food is increased. This controls the growth of microorganisms. The microbial activity is further suppressed by the addition of preservatives.

This method can be used to preserve food items such as jam, cordial etc.



Figure 13.9 ▲ Concentrated food

Let us summarize the reasons why it is possible to prevent spoilage of food and keep them longer by various preservation methods.

Table 13.2

Preservation method	Reason for preservation
Drying	Microorganisms do not grow on food due to removal of water
Control of temperature (freezing and deep freezing)	Control of the growth of microorganisms due to a favourable temperature for their growth is not available
Concentration/ immersing in honey	Control of the growth of microorganisms due to removal of water in food and destruction of microorganisms due to removal of water from them
Smoking	Minimizing microbial activity due to chemicals in smoke and removal of water from food due to drying
Adding chemicals (preservatives)	Control of the growth of microorganisms due to removal of water in food and destruction of microorganisms due to removal of water from them



## For extra knowledge

- Liquid milk can be kept longer by pasteurization. In this method pathogenic bacteria in milk causing diseases are destroyed by heating milk for about 15 seconds at the temperature of 72 °C. Pasteurized milk can be kept for about two weeks in a refrigerator (a).



(a)

- Milk packets you drink have been pasteurized by subjecting to a temperature as high as 138 °C for about 1-2 seconds (Ultra pasteurization). Milk pasteurized by this method can be kept in refrigerators for about 2-3 months when stored in closed containers (b).



(b)

- Milk available in the market under the name 'Kalkiri' is sterilized milk. During sterilization all the microorganisms are destroyed. In sterilization, milk is heated for about 15 - 20 minutes at the temperature of 120 °C. This milk need not (c) to be kept in a refrigerator for storage. But once opened, it should be kept in a refrigerator (c).



(c)

## 13.3 Food preservatives

The chemical substances added to the packaged food in preservation are called additives. Figure 13.10 shows some additives

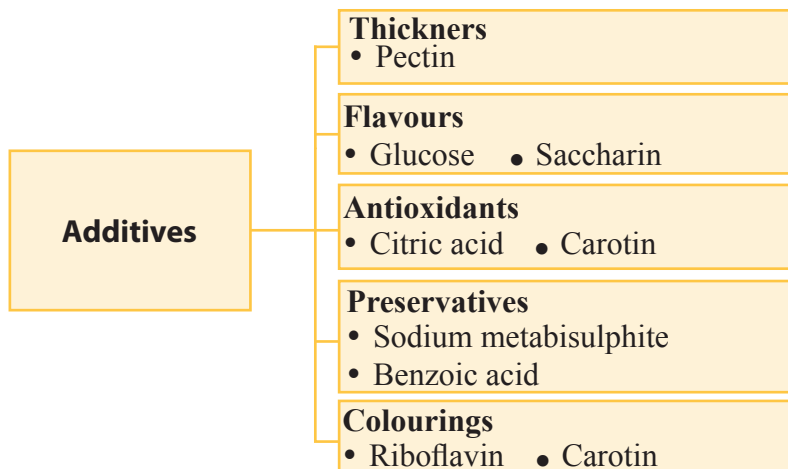


Figure 13.10 ▲



The substance used to prevent the action of microorganisms causing food spoilage and the effect of other external and internal factors are known as **preservatives**. Preservatives are a type of additives.

The code (E number) is adopted by the European Union to symbolise the food adding approved for use and are experimentally confirmed as safe.

The preservatives from E 200 to E 299 have been allowed to add to the food as synthetic food additives. Mainly acids and salts can be seen among these.

A few chemical substances prescribed to be used as synthetic food additives are given below.

- Sodium metabisulphite
- Sodium bisulphite
- Benzoic acid
- Sodium chloride
- Sodium nitrite and sodium nitrate
- Acetic acid

The additives mentioned above should be those prescribed by the food act in Sri Lanka and it is important that they are added in prescribed quantities. Any preserved food items that are not suitable for children should be clearly stated in the label.



### **For extra knowledge**

Flavours are added to food such as instant food and soup cubes available in the market. But giving flavoured food to children under the age of three years is not safe as far as their health is concerned. Monosodium glutamate (MSG) added to food is a flavour and is not a preservative. Use of these beyond the prescribed dose is not favourable for health. Some food colourings are carcinogenic.

Let us engage in Activity 13.2 to study the preparation of jam as a preserved type of food.



## Activity 13.2

**You will need:-** 500 g of fruits (mango, pineapple, orange), 500 g of sugar, 1g of citric acid, 10-15 g of pectin, about 0.25 g of sodium metabisulphite

**Method:-**

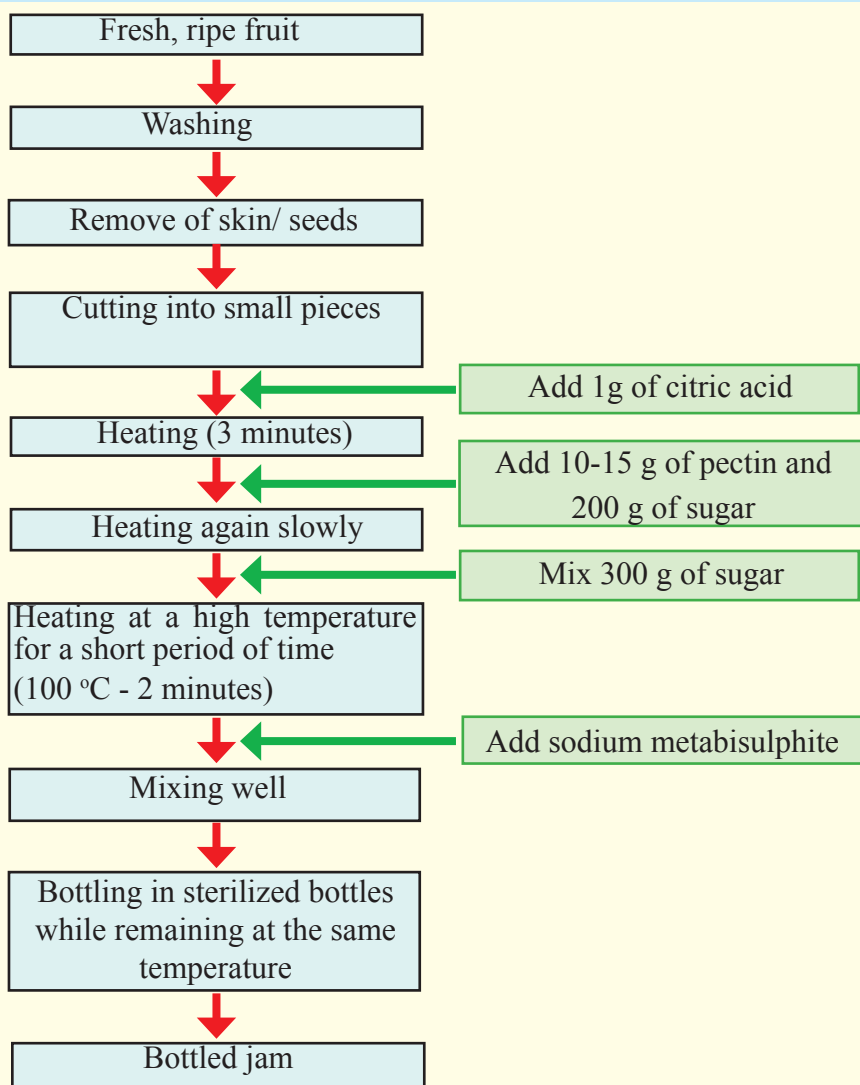


Figure 13.11 ▲



### Assignment 13.4

- If there is a food processing factory in your area (such as canned fish, sauce, cordial, jam etc.) arrange a field trip to observe it.
- Observe the manufacturing process.
- Draw a flow chart to present the process.
- Prepare a booklet about your field trip.

### Various types of preserved food

- Some preserved food can be directly consumed.  
**e.g.:- Chutney, jam, sauce, fruit drinks etc.**
- Some preserved food can be consumed after instant preparation. Those are food types packed after subjecting to a complex process and addition of preservatives. They are known as processed (pre-cooked) food.  
**e.g.:- Meat balls, sausages, noodles, macaroni, coconut milk powder, cordial etc.**
- Some preserved food needs to be cooked before consumption.  
**e.g.:- Dried fish, cereals etc.**



### Assignment 13.5

- Prepare a list of processed food available in the market.
- Investigate how food items such as fruit cordial, 'lunudehi', tomato ketchup are prepared.
- Make those food and taste them either in the classroom in groups or at home.
- Indicate by flow charts how those food items are prepared.

## 13.4 Advantages and disadvantages of food preservation

Let us do Assignment 13.6 to study advantages and disadvantages of food preservation.



### Assignment 13.6

- Study well about preserved or processed food and non preserved food.
- List separately the advantages and disadvantages of the consumption of preserved food and processed food.

Compare the advantages and disadvantages mentioned with the following facts.

#### Advantages of food preservation and processing

- Ability to prevent food spoilage  
Food poisoning and ailments caused by the consumption of spoiled food can be prevented.
- Ability to select according to appetite because the same source of food is prepared in different ways
- Ability to impart an attractive look for food
- Ability to increase the nutritional value of some food types (yoghurt, cheese) by changing their existing nature
- Utilize the surplus effectively
- Ability to keep them for off season consumption
- Minimize the damage caused by insects and other animals

#### Disadvantages of food preservation

- Running a risk of being prone to diseases for the addition of non permitted additives and addition beyond prescribed limits.
- Increase in the risk of causing diseases (e.g:- cancer, diabetes, heart diseases) due to artificial additives such as flavours and colourings
- Possibility of destroying vitamins and other nutrients
- Tendency to change the characteristic flavour, smell and colour of the food.
- Reduce the desire for natural food and getting used to consumption of instant food

## 13.5 Information in a label of a food package

Let us do Activity 13.3 in order to study further about the facts we need to take into consideration as customers when buying packaged food items.



### Activity 13.3

**You will need:-** A few labels of packaged food items

**Method:-**

- Study well the packets/cartons of the food items and their labels well and list the information relevant to ensure their quality.

Table 13.3

Number	Packaged Food	Method of preservation	Additives	Date of manufacture	Date of expiry

Compare the information you collected with the following.

Some important information given on the label of a packed food item are as follows.

- Date of manufacture and date of expiry
- Net weight / Total weight
- Standard
- Producer (Institution / Country)
- Environment friendliness / Consumer friendliness of the packet/ wrapper

### **Date of manufacture and date of expiry**

Food can be packed only for a limited period of time protecting their nutritional quality. As time elapses, physical and chemical changes may take place in food. Moreover, food may get spoiled due to microbial activity.

### **Net weight / Total weight**

The consumer should be aware of the amount of the substance in the package.

## Standard

If the food item is prepared according to the standards prescribed by the Sri Lanka Standard Institute, the cover of the package should have the SLS logo along with the relevant numbers. If the food item is prepared according to the International standards the package should have the ISO logo along with the relevant numbers.



Figure 13.12 ▲ Quality certificate logos of standards

Food items with the standard certification are considered to be high in quality.



## Assignment 13.7

- There are instances where food is adulterated by adding various substances for the purpose of making profit. Be cautious about such instances.
- Make a list of food items which are adulterated.
- In each example you mentioned, state the substance added to the food.

## Details of the manufacturer

Information about the manufacturer or the country that produces the food item is important for taking legal action in case unexpected results are caused due to consumption of food.

## Environment friendly/ consumer friendly nature of the wrapper

Since some food types contain flavours, colourings and preservatives with time they may react with the packing and form substances injurious for health. These wrappings are harmful for personal health as well as the environment.

Therefore, when buying packaged food, it is very important to pay attention not only to the quality of food but also to all the information given in their labels. Proper packaging is essential to minimize wastage of food during transport. Some of its advantages are:

- Prevention of the entry of microorganisms and macroorganisms
- Protection of food from external factors such as air, water (moisture), light and heat
- Maintenance of quality and quantity of food
- Facilitation of transport and storage



## For extra knowledge

Only prescribed varieties of plastics can be used to pack food. They are known as super grade plastics.



- The symbols given in the packaging which are suitable for food are given here.
- Recycled plastics should never be used as food wrappers.
- Plastics used to pack other materials should not be used to pack food.
- Oily or basic food types should not be packed in non-prescribed plastic containers.
- Strongly heated food is not suitable for packaging.

During food preservation very often synthetic flavours and colourings are added and food is subjected to a complex mode of processing. Hence, it is very important to get used to consume natural food.



## Summary

- Food spoilage is mainly caused by the growth and action of microorganisms on food.
- Food preservation, is keeping food for a longer period of time by artificially controlling the factors affecting food spoilage.
- Minimizing food spoilage, utilization of surplus food, ability to consume some food types in the off-season and prevention of food poisoning are the advantages of food preservation.
- Food preservation descends from the past. At present, food is preserved by modern technological methods.
- When buying packaged food, it is very important to that quality of food as well as the information given in the label, are taken into consideration.
- It is always favourable to consume natural food whenever possible, in order to maintain good health.

## Exercise

1. Select the correct answer.

1. The correct method of preserving food is

- |             |                       |
|-------------|-----------------------|
| 1. Salting  | 2. Smoking            |
| 3. Freezing | 4. Immersing in honey |

2. Some aims of adding additives to food are given below.

A - Adding a flavour to food

B - Keeping food viscous

C - Preventing food from reacting with oxygen

Of the above the correct reasons are

1. A and B    2. B and C    3. A and C    4. A, B and C

3. An example for a pre-cooked food is

- |                          |                |
|--------------------------|----------------|
| 1. Powdered coconut milk | 2. Chutney     |
| 3. Jam                   | 4. Fruit drink |

4. Which of the following is a disadvantage of food preservation

1. Prevention of food spoilage
2. Imparting an attractive appearance for food
3. Increasing nutritional value of food
4. Reducing appetite for natural food

5. Which of the following is a food that does not spoil fast

1. Cow milk    2. Bread    3. Dry green gram    4. Fish

2. Place a tick (✓) if it is correct and a cross (×) if it is incorrect.

1. Cow milk is a food which spoils faster ( )
2. Use of food added with synthetic colourings or flavours is not very ( ) appropriate, for consumption.
3. It is not faulty to wash and reuse food wrappings ( )
4. It is compulsory to state the date of preparation of food in the label of ( ) a bottled food.
5. Change in the nutritional quality of food due to drying, prevents ( ) microbial action



3. State the method/methods used in the preservation of following food types.

- Dried fish
- Jam
- Chutney
- Sterilized milk ('kalkiri')

4. State separately the reasons why food does not get spoiled in the following methods of preservation.

- Drying
- Keeping in the refrigerator
- Salting
- Smoking

## Technical Terms

Food preservation	-	ஊதார பரீரக்சணய	-	உணவு நற்காப்பு
Preservatives	-	பரீரக்சண	-	நற்காப்புப் பதார்த்தங்கள்
Processed foods	-	பிரிபுகஐதீ ஊதார	-	பதப்புடுத்தப்பட்ட உணவுகள்
Traditional methods	-	஑ாதீபுடா஑ிக ஑ுத	-	பாரம்பரிய முறைகள்
Technological methods	-	தாக்சணிக ஑ுத	-	தொழிநுட்ப முறைகள்
Artificial colourings	-	கா஑்ரித லர்ணை	-	செயற்கை நிறமூட்டிகள்
Standards	-	புதீதீய	-	தரம்
Food flavours	-	ர஑ புவர்஑க	-	உணவுச் சுவையூட்டிகள்
Natural foods	-	஑்வா஑ாவிக ஊதார	-	இயற்கை உணவுகள்
Additives	-	ஊகலத ஑ுவ	-	சேர்மானங்கள்
Quality	-	஑ுணாதீக஑வ	-	பண்புத்தரம்
Date of expiry	-	கடீ ஑ு஑தீ லீதீ ஑ீதய	-	காலாவதித் திகதி
Date of manufacture	-	தீ஑ீபா஑ீக ஑ீதய	-	உற்பத்தித் திகதி
Net weight	-	஑ு஑ீ஑ ஑ர	-	நிகர நிறை
Constituents	-	஑஑஑஑ ஑஑஑஑	-	அடங்கியுள்ள பதார்த்தங்கள்
Nutrients	-	஑ரீ஑க	-	஑ோசணை