

# UNIT 8

## FOOD PRESERVATION TECHNOLOGY



Why can't the food be eaten?  
Do you know how to prevent food from spoiling?



# Food Spoilage

Alia wants to eat her breakfast before going for her extra class.



Food becomes spoiled due to the action of microorganisms such as bacteria and fungi, which decompose food from complex to simpler forms.



What are the characteristics of spoilt food?

Spoilt milk can be seen if its texture changes when bubbles and lumps are formed. It also smells bad and tastes sour. The milk tastes sour because the bacteria in it produces acid.



Spoilt bread and rice will be covered with black spots known as moulds. The rice becomes slimy and smelly. The water content in the food and humidity in the air promote the growth of microorganisms like fungi.



8.1.1,  
8.1.2,  
8.1.3

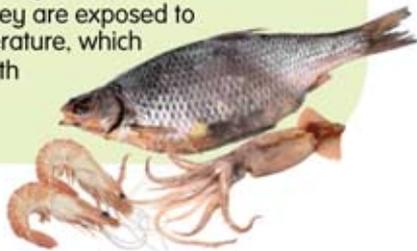


Decomposition is a process where organic matter is broken down into simpler form by microorganisms.

Spoilt fruits and vegetables become mouldy. They change in texture, taste, and colour. Fruits and vegetables are spoilt when microorganisms decompose them.



Spoilt beef and chicken look blackish, become smelly, and slimy. Spoilt fish, squids, and prawns change in texture, smell bad, feel sticky, and become mushy. These food become spoilt when they are exposed to the surrounding temperature, which is suitable for the growth of microorganisms.

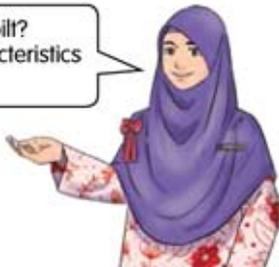


The characteristics of spoilt food can be detected using our senses of sight, smell, taste or touch. Spoilt food can be observed through the changes in its texture and colour, has a bad and unpleasant smell, has a sour and unpleasant taste, and feels sticky and slimy when it is touched.



food spoilage

What causes food to become spoilt?  
Give other examples of the characteristics of spoilt food.





**Apparatus and materials:** chopping board, knife, four food containers with lids, water, food such as bread, vegetable, fruit, cheese, raw chicken slices



Be careful when using knives.

**Steps:**

1. Cut the food into smaller pieces.
2. Dip them in water.
3. Store them in a sealed container.
4. Make an observation after one week.
5. Record your observation in the table.

Type of food	First day	Seventh day
bread	/	/
vegetable	/	/
fruit	/	/
cheese	/	/
raw chicken slices	/	/

1.



2.



3.



6. Two members of your group will move to the other groups to observe the tested food.
7. Share the result of the observation in your own group.

**Questions:**

1. Give an inference based on your observation.
2. State the characteristics of the spoilt food.
3. What causes food to spoil?



## Food Preservation

Alia received a food package sent by her grandmother from her home town.



What is the meaning and the purpose of food preservation?

Food preservation is the process of slowing down food from getting spoilt. Food is preserved to prevent or slow down the growth of microorganisms.



Microorganisms are the main cause of food spoilage. They grow when there is water, air, as well as suitable temperature and acidity.



How can food preservation help to prevent the growth of microorganisms?

There are various food preservation methods that can be used to prevent the growth of microorganisms in food.

## Food Preservation Methods

### Drying

The food is dried using heat to get rid of the water content. Using this method, the microorganisms are not able to survive because of the absence of water.



dried fish

dried chillies

### Boiling

Food that is cooked and boiled at high temperatures will last longer. High temperatures kill most microorganisms.



The durian paste is boiled until it becomes concentrated jam.

### Cooling

The food is stored in a cool place at a temperature of about 4°C. The low temperature slows down the growth of microorganisms.



vegetables, fruits,  
dairy products

### Freezing

The food is frozen at the freezing point of 0°C and below. Very low temperatures stop the growth of microorganisms.



beef, fish,  
seafood

## Vacuum packing

The food packaging is vacuumed and stored. Microorganisms cannot grow in the absence of air.

beef, vegetables,  
fruits



vegetables, fruits,  
fish

## Canning

The food is cooked and cooled before it is put into a can. The can is then soldered to make it airtight. The absence of air when the food is canned prevents microorganisms from growing. Next, the can is heated at high temperatures to kill the microorganisms.

## Bottling

The food is processed, boiled, and then cooled before being placed in airtight bottles. High temperatures and lack of air kill the microorganisms.

vegetables, beans,  
seafood



## Pasteurising

The food is heated at 63°C for 30 minutes or at 72°C for 15 seconds. It is followed by immediate cooling at 4°C before being packed and stored. For high temperature pasteurisation (UHT), the food is heated at 135°C for 2 seconds. It is followed by immediate cooling at 4°C. Heating at high temperatures kill the microorganisms. Whereas, low temperatures prevent the growth of microorganisms and make them less active.



juice, dairy products



## Pickling

The food is soaked in vinegar or in a highly concentrated solution of sugar or salt. Unsuitable acidity makes it difficult for microorganisms to grow.

mangoes, fish, chillies

## Salting

The food is smeared with a large quantity of salt to remove the moisture in the food. The absence of water prevents the growth of microorganisms.



fish, eggs

## Smoking

The food is dried using smoking technique, which takes a long time. The absence of water slows down the growth of microorganisms. Beef, ducks, chickens, fish, and bananas can be preserved through smoking.



beef, ducks, chickens



bananas

## Waxing

Coating wax onto the surface of the food prevents air and water from entering it. This can prevent the growth of microorganisms.

vegetables, fruits



Why is food preserved? Explain the relationship between food preservation methods and factors that affect the growth of microorganisms.



# Food Preservation Project

Various food preservation methods can be done to ensure that the food lasts longer and does not spoil quickly. Let us do the chilli preservation project using various preservation methods.

Can one type of food be preserved using various preservation methods?



## Chillies Preservation Project

### First Method



**Aim:** To carry out a project of preserving chillies using the drying method

**Apparatus and materials:** weighing scale, airtight container, wire mesh grill, plastic gloves, 150 g of fresh chillies, kitchen tissues



Avoid touching your eyes or nose when handling the chillies.

### Steps:



Wear plastic gloves when cleaning the chillies.



Dry the chillies using kitchen tissues.



Weigh and record the initial mass of the chillies.



Arrange the chillies on a wire mesh grill. Dry the chillies under the sunlight for seven days.



Weigh the dried chillies and record the final mass.



Store the dried chillies in an airtight container.

### Questions:

1. What is the food preservation method used to preserve the chillies?
2. What is the microorganism growth factor involved in this preservation method? Explain.
3. What is the difference between the initial mass and the final mass of the chillies? Give your inference.

## Second Method



**Aim:** To carry out a project of preserving chillies using the pickling method

**Apparatus and materials:** cooking pot, gas stove, knife, plastic gloves, kitchen tissues, sterilised glass jar with a lid, 15 fresh chillies, three tablespoons of salt, six tablespoons of sugar, two cups of food vinegar



1. Avoid touching your eyes or nose when handling chillies.
2. Be careful when handling knives.
3. Be careful when handling gas stoves.

### Steps:



Wear plastic gloves when cleaning the chillies.



Dry the chillies using kitchen tissues.



Slice the chillies using a knife.



Put the sliced chillies into a glass jar.



Put three tablespoons of salt into the glass jar.



Heat two cups of food vinegar and add six tablespoons of sugar. Stir the solution until it is dissolved.



Then, pour the hot solution into the glass jar containing the chillies.



Let the vinegar cool and close the glass jar tightly.

### Questions:

1. What is the food preservation method used to preserve the chillies?
2. What is the microorganism growth factor involved in this preservation method? Explain.

### Third Method

**Aim:** To carry out a project of preserving chillies using the freezing method

**Apparatus and materials:** freezer, ziplock bag, plastic gloves, kitchen tissues, 15 fresh chillies

Avoid touching your eyes or nose when handling chillies.

#### Steps:



Wear plastic gloves when cleaning the chillies.



Dry the chillies using kitchen tissues.



Put the chillies into a ziplock bag.



Press the ziplock bag to remove the air completely before sealing it.



Store the ziplock bag in the freezer of a refrigerator.



Wait for the chillies to freeze completely.

#### Questions:

1. What is the food preservation method used to preserve the chillies?
2. What is the microorganism growth factor involved in this preservation method? Explain.

## Fourth Method

**Aim:** To carry out a project of preserving chillies using the boiling method

**Apparatus and materials:** wok, gas stove, blender, container with a lid, plastic gloves, 15 fresh chillies, two cups of water, cooking oil



1. Avoid touching your eyes or nose when handling chillies.
2. Be careful when handling gas stoves.

### Steps:

1.



Wear plastic gloves when cleaning the chillies.

2.



Put the chillies, two cups of water, and two tablespoons of cooking oil into a blender.

3.



Blend the chillies until they turn into a paste.

4.



Boil the chilli paste in a wok until it thickens.

5.



Turn off the heat and let the paste cool down.

6.



Put the chilli paste into a container with a lid.

### Questions:

1. What is the food preservation method used to preserve the chillies?
2. Why is cooking oil used in this preservation method? Explain.
3. What is the microorganism growth factor involved in this preservation method? Explain.

Chillies can be preserved using various preservation methods such as drying, pickling, freezing, and boiling. Thus, it is proven that one type of food can be preserved using various methods.

What can you conclude about the food preservation methods that have been carried out?



## Combination of Food Preservation Methods

Did you know that food can also be preserved by combining more than one preservation method?



Let us do an activity that combines the various food preservation methods.



### LET'S TEST

### Combination of Food Preservation Methods

**Aim:** To carry out fish preservation activity by combining more than one preservation method



**Apparatus and materials:** knife, chopping board, wire mesh grill, two fish, 300 g of fine salt



Be careful when using knives.

#### Steps:

1. Remove the gills and the inner parts of a fish. Then, clean the fish using water.
2. Cut the fish and spread it out as shown in the picture.
3. Smear salt all over the fish.
4. Place the fish on a wire mesh grill.
5. Dry the fish under the sunlight. Flip it for a period of one week until it is dried.
6. Record your observation.



#### Questions:

1. What are the food preservation methods used to preserve the fish?
2. Why is a large quantity of salt used?
3. What can you conclude from the activity above?

8.2.5  
8.2.7



Give another example of food that can be preserved by combining more than one food preservation method.

# The Importance of Food Preservation Technology

Food preservation technology is very important to meet the continuous demand for food supply.

How is the food preservation technology able to meet the demand for food supply in our daily lives?



## Food has a longer shelf life



*Cencaluk, Inang-inang rice crackers, and fish crackers are examples of food that can last for a long time.*

Do these food have long shelf lives?



Yes, they can be kept until next year.

Preserved food can last and be stored longer. Therefore, the continuous demand for food supply can be achieved.

## Food waste can be avoided and prevented

Mother, there is still some leftover beef *rendang* from the event.

We can use it to make beef floss to prevent food waste.



Food leftovers can be processed and dried.



Food that is preserved using various preservation methods can avoid and prevent waste from happening.

## Food becomes easier to store



Canned and bottled food do not need a large space to store.

Father, we bought a lot of food. Do we have enough space to store them?

Don't worry. Canned food is easy to arrange and store.



Food that is preserved through canning and bottling can save space and it is easier to store.

## Continuous supply of out of season food



This is a home-made rambutan jam. I preserved the fruits during the fruit season last year.



Seasonal fruits such as durians, rambutans, and mangosteens can be preserved.

Seasonal foods can be preserved using various preservation methods so that they can be enjoyed throughout the year.

## Food becomes easier to be exported

The coconut milk products are ready to be exported.



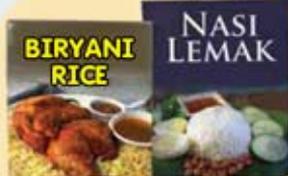
Okay. Send them to the container ship now.



Some food made in Malaysia can be enjoyed in other countries.

Food preservation technology allows food to be exported to other countries.

## Production of instant food



Instant food is easy to prepare and can be brought anywhere.

I'm eating *rendang* and rice for dinner.

Wow, they must be delicious!



Instant food that is preserved can ease the food supply management when food is limited especially during drought, winter or when natural disasters occur.

Nowadays, food preservation technology has helped to meet the demand for food supply in our daily lives. The importance of food preservation technology includes producing food with longer shelf lives, avoiding and preventing wastage, easier storing of food, ensuring supply of food that are out of season, making food easier to be exported, and producing instant food.

Based on your understanding, discuss the importance of food preservation technology to meet the demand for food supplies.



### SCIENCE INFO

Every preserved food has an expiry date. For example, 'USE BEFORE 14 APRIL 2021'. This shows that the food should be consumed before the stated date.





## FUN ACTIVITY Pickled Fish



**Apparatus and materials:** knife, chopping board, container with a lid, wire mesh grill, kitchen tissues, fish, salt, cooking oil

### Steps:

1.



Remove the gills and the inner parts of a fish. Then, clean the fish using water and dry it using kitchen tissues.



Be careful when using knives.

2.



Dry the fish under the sunlight for two hours.

3.



Smear the fish with salt until it is fully covered.

4.



Put the fish into a container with a lid. Pour cooking oil into the container until the fish is completely immersed.

5.



Close the container and store the fish for a few days.

### Questions:

1. What is the food preservation method used in this activity?
2. What is the purpose of using salt and cooking oil in this preservation method?
3. Why can the preserved fish be stored for a long time?
4. State other suitable food that can be preserved using the same preservation method.



Make the *Inang-inang* rice crackers using a stove, a wok with a lid, sieve, a container with a lid, wire mesh grill, tray, water, one bowl of rice, one teaspoon of salt, and four tablespoons of tapioca flour.

**Steps:**

Be careful when handling gas stoves.



Soak a bowl of rice in water for five minutes. Then, strain off the water.



Mix one tablespoon of salt and four tablespoons of tapioca flour into the soaked rice.



Scoop a tablespoon of the rice mixture and spread it thinly over a wok which is heated over a small fire. Cover the wok with a lid for three minutes.



Flip the dough over to dry both sides of the dough.



Remove the crackers and let them cool on the wire mesh grill.



Place the crackers under the sunlight until they are dried.

7. Store the crackers in a sealed container. They can be stored for a long time.

8. Before consuming, fry the crackers in hot cooking oil.



*Inang-inang*  
rice crackers





## MIND REFLECTION

1. Food is spoiled due to the action of microorganisms.
2. Spoilt food is caused by the:
  - presence of water
  - suitable temperature
  - presence of air
  - suitable acidity
3. Characteristics of spoilt food are as follows:
  - Spoilt milk becomes bubbly and lumpy, smells bad, and has a sour taste.
  - Spoilt bread and rice are covered with black spots, become slimy, and produce bad smell.
  - Spoilt fruits and vegetables become mouldy, and change in texture, taste and colour.
  - Spoilt beef and chicken look blackish, become smelly, and feel slimy.
  - Spoilt fish, squids, and prawns change in texture, produce bad smell, become sticky and mushy.
4. The purpose of food preservation is to prevent or to slow down the growth of microorganisms.
5. Food preservation methods are as follows:
  - drying
  - boiling
  - cooling
  - freezing
  - vacuum packing
  - canning
  - bottling
  - pasteurising
  - pickling
  - salting
  - smoking
  - waxing
6. Food can be preserved by:
  - using more than one food preservation method.
  - combining more than one food preservation method.
7. The importance of food preservation technology are as follows:
  - food has a longer shelf life
  - food wastage can be avoided and prevented
  - food becomes easier to store
  - continuous supply of out of season food
  - food becomes easier to be exported
  - production of instant food



## MIND TEST

Answer all questions in the Science exercise book.

1. Observe the following food. State the characteristics that can be identified if the food is spoiled.



2. Look at the picture below.



- (a) What is the food preservation process shown in the picture on the left?  
(b) State the purpose of preserving this food.

3. The picture below shows various types of seafood.



- (a) What is the most suitable method to preserve the food as shown in the picture?  
(b) What are the growth factors of the microorganisms involved in the preservation method stated in 3(a)? Explain.

4. The pictures below show three types of food.  
State the various preservation methods for the food below.



5. Look at the picture on the right. Puan Anis wants to preserve the food. The food can be preserved by combining more than one preservation method so that it can be stored longer. State the food preservation methods.

