

5

Food Preservation

5.1 Introduction

Have you ever eaten methi paranthas in the month of June? If yes, where did the methi come from? Not from the vegetable market, because it is not available in the month of June! On a certain day, if the dishes are not to your liking, you prefer to eat food with pickle or mango chutney. Have you ever wondered how preparations such as pickles, potato chips, tomato sauce etc. are present in your house throughout the year? Why do they not get spoilt? There are definite months in a year when pickles, papads, chips, squashes etc, are prepared and stored for the year. In this lesson let us learn about these foods which can be stored for long periods without getting spoilt.

5.2 Objectives

After reading this lesson you will be able to:

- define food preservation;
- state the significance of food preservation;
- enumerate causes of food spoilage;
- describe general principles of food preservation;
- explain the importance of hygienic handling of food;
- describe methods of preserving food at home.

5.3 What is Food Preservation

The dictionary meaning of the word “preserve” is to keep safe, retain quality, prevent decomposition or fermentation. When we apply this meaning to food preservation it can be defined as:-

A process by which certain foods like fruits and vegetables are prevented from getting spoilt for a long period of time. The colour, taste and nutritive value of the food is also preserved.

Let us understand this definition in a little more detail. The definition says *preventing foods from getting spoilt*. When you keep fruits, vegetables or left over dal in the refrigerator or in a cool place, will this be called food preservation? No, because you can store fruits and vegetables or left over dal in this state for a few days only.

The definition of food preservation states that the preserved food should *retain their colour and taste*. This means that the colour and taste of food which is present at the time of preservation should not change. Let us take the example of preserving grapes as raisins. Raisins are prepared by sun drying grapes. During the drying process the grapes change colour from green to brown, and taste, sweeter. However, once they are dried and stored, they do not change colour or taste.

Like colour and taste, a well preserved food should *not change texture*. When your mother makes mango murraba at home, have you observed the texture of the mango pieces? It is firm. In a well made murraba, this firmness of mango pieces should not change after sometime.

5.4 Why Do We Need to Preserve Foods?

Now that you have understood the definition of food preservation, did you think about why we should preserve foods? Can you think of a few reasons for preserving foods? Let us find an answer to this question by taking an example of one food item.

Let us take the example of a fruit, say mango. There are many ways by which mangoes can be preserved. These are:- juice, murraba, squash, aam papad, pulp, chutney, pickle, raw mango powder.

You may be able to add a few more to the above list.

Mango is a summer fruit and grows in large quantities during the months of April to August. Different varieties of mango are grown in different parts of our country. Usually all the quantity grown in a region cannot be consumed by the people staying there as there is always an excess. What does the farmer do with this excess quantity? He makes arrangements to transport the excess quantity to regions where either mango is not grown or where that particular variety of mango is not available. If he does not do this, the excess produce will rot and go waste. The farmer will then lose money.

There is still some quantity which is left after the fresh fruit is consumed by the people. It is this quantity which has to be preserved for consumption during the months when mango is not available. Preservation of foods is done during the months when food is available in large quantity and therefore at low cost.

One of the important reasons for preserving foods is to take care of the excess produce.

There are many other reasons for preserving foods. Let us learn about these.

2. The second reason for preserving foods is that they add **variety to our meals**. Have you ever got tired of eating the same vegetables which are in season? Is it not nice to eat peas when they are either very expensive in the market or are not available? Eating cauliflower in pulav or cauliflower vegetable during the summer months adds to the interest in meals. In the same way, eating some chatni, papad or pickle along with the meals adds to the variety. Preserving foods when they are in season makes this possible.



3. **Reaches areas where the food item is not grown**

In some areas of Rajasthan which are desert areas and in Himalayan regions that are covered with snow most of the time, very few foods can be grown. Availability of some preserved foods can add to the variety and nutritive value of meals. For example inclusion of dehydrated peas, green leafy vegetables, canned fruits etc, in the meals is a good idea in such areas.

4. **Makes transportation and storage of foods easier**

Preservation of foods usually reduces bulk. This makes their transportation and storage easier since it requires less space. For example, if you dry green leafy vegetables such as mint, methi, corriander, etc, their weight and volume reduces, thus making their storage easy.

INTEXT QUESTIONS 5.1

1. Fill in the blanks
- i. Food preservation keeps the food in a state that it does not for long time.
 - ii. A well preserved food item should not change and
2. We preserve foods to
- (i) reduce wastage due to rotting
 - (ii) improve their colour and texture.
 - (iii) increase their shelf life.
 - (iv) eat costly foods.
 - (v) change their taste and flavour
 - (vi) add variety to our meals.
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5.5 Why Does Food Get Spoilt

The definition of food preservation states that preservation is keeping food in such a state that they do not get spoilt for a long period. Before we look at the reasons of food spoilage, let us understand, when is a food spoilt.

When you keep bread outside the refrigerator for few days, a spongy growth is seen on it, which may be white, green on black in colour. The bread thus gets spoilt due to growth of mold and becomes unfit for consumption. Likewise, if cooked dal or vegetables is left outside for sometime, it develops a bad smell and bubbles due to fermentation. The dal and vegetables are thus spoilt and cannot be eaten. Can you now say when is a food spoilt?

Food is said to be spoilt if there is rotting i.e., bad smell, fermentation ie, bubbles/gas in the food or mold ie, spongy growth on the food stuff. Formation of soft spots or soft brown spots on fruits and vegetables is also food spoilage.

Why do foods get spoilt? If you know the reasons of food spoilage, you can remove these conditions while preserving food items. Foods get spoilt mainly due to the presence of micro organisms, enzymes (present in foods), insects, worms, and rats. Let us discuss these factors in some more detail.

1. Presence of micro-organisms: Micro means small. Micro organisms are very small organisms which cannot be easily seen. Micro-organisms spoil food items when the condition for their growth are appropriate. What are these appropriate conditions? Like all living beings micro-organisms require air, moisture, right temperature and food to grow and multiply. The situations which provide appropriate conditions for growth of micro-organisms, can be listed as.

- Food having high moisture content
- Air around the food containing micro organisms
- Foods kept for a long time at room temperature
- Skin of fruits and vegetables getting damaged, thus exposing the food to micro organisms.
- Foods with low salt, sugar or acid content.

Resulting in spoilage of foods

If you want to prevent spoilage of foods by micro organisms, you must remove the conditions mentioned above.

2. Presence of enzymes: Enzymes are chemical substances found in all plants and animals. Are enzymes harmful to foods? No, enzymes help in ripening of fruits and vegetables. A raw green mango after a few days becomes sweet in taste and yellow in colour due to the enzymes action. What will happen if you keep this

yellow, ripe mango for a few more days? It will become soft, develop black spots and will start smelling bad. This is due to continued action of enzymes. No one likes to eat such as over ripe, spoilt mango. You know that even when the skin of fruits is not cut or damaged, it gets spoilt. This is due to enzyme action.

- 3. Insects, worms and rats:** Have you noticed small brownish black insects or small white worms in rice and dals? These insects eat the food grains. They make small holes in the grain and at times convert the grain to a fine powder. The food grain thus become unfit for human consumption.

You have just learnt the three main causes of food spoilage due to micro organisms, enzymes action and insects, worms and rats.

5.6 Principles of Food Preservation

After learning about the causes of food spoilage, it should not be very difficult to list the principles of food preservation. Remember, a good method of food preservation is one that slows down or prevents altogether the action of the agents of spoilage. Also, during the process of food preservation, the food should not be damaged. In order to achieve this, certain basic methods were applied using the knowledge gained from observation of the effects of natural conditions on different types of foods. For example in earlier days, in very cold weather condition, ice was used to preserved foods. Thus, very low temperature became an efficient method for preventing food spoilage. Let us now list the principles of food preservation.

- 1. Removal of micro-organisms or inactivating them:** This is done by removing air, water (moisture), lowering or increasing temperature, increasing the concentration of salt or sugar or acid in foods. If you want to preserve green leafy vegetables, you have to remove the water from the leave so that micro organisms cannot survive. You do this by drying the green leaves till all the moisture evaporates.
- 2. Inactivating enzymes:** Enzymes found in foods can be inactivated by changing their conditions such as temperature and moisture, when you preserve peas, one of the methods of preservations is to put them for a few minutes in boiling water. This method inactivates enzymes and thus, in preserving the food.
- 3. Removal of insects, worms and rats:** By storing foods in dry, air tight containers the insects, worms or rats are prevented from destroying it.

INTEXT QUESTIONS 5.2

1. Fill in the blanks
 - (i) If you cut an apple and it shows brown soft spots inside, this is due to
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- (ii) Foods containing higher moisture content can get spoilt due to production of
 - (iii) The three principles of food preservation are, and
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5.7 Methods of Preserving Foods at Home

Foods can be preserved at home by the following methods-

- (i) Dehydration
- (ii) Lowering temperature
- (iii) Increasing temperature
- (iv) Using preservatives

Let us now discuss each method in some detail.

(i) Dehydration

Can you name some dried food items that are stored in your kitchen for a period of one year or more? Are these potato chips, sevia (vermicilli), methi, cauliflower, papad, ginger powder?

These are foods which have been preserved by the dehydration method. The word dehydration means removing water or moisture from foods. The home method of dehydration is sun drying. We will now discuss this method in some more detail.

Some foods are dried as they are, eg, green leafy vegetables (methi, pudina, coriander etc.) cauliflower, grapes, amla, onion, raw mango, etc. Some foods are cooked and then dried. For example potato chips, papad, banana, chips, wadis, etc. The most appropriate weather to dry foods is when the air is dry and there is strong sunshine. Let us understand the basic method of dehydration before we learn to apply it to individual foods.

- | | |
|--------|---|
| Step 1 | Clean all tins, plates, etc, to be used to dry and store the food. Dry in sun. Storage tins should have airtight lids. |
| Step 2 | Wash the vegetables/fruits to be dehydrated. Cut, if required. Remove the stem, seeds, skin. Remove any decaying portions. |
| Step 3 | Blanch vegetables, i.e., put them in boiling water. Time for blanching varies with hardness of fruit/vegetables. Remove when the food is soft (blanching reduces enzymed activity). |
| Step 4 | Put vegetables in cold water containing salt and potassium |
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metabisulphite(kms) for 5-10 minutes. This prevents blackening of foods. Green leafy vegetables and other dark vegetables should not be put in this solution.

Step 5 Spread on a clean cloth in the sun. Cover with a thin cloth to avoid dust and flies getting into the food.

Step 6 When the food is dry, (test by looking at hardness), cool to room temperature. Store in an air tight container.

When you want to use dehydrated fruits and vegetables, wash and soak in water for some time.

Now let us look at how you can use this method to preserve a specific food items, eg, methi and potato.

1. Dehydrating methi

Can you list the steps for drying methi?

1. Wash methi and remove the stems.
2. Put on a cloth in the sun, cover it.
3. Cool to room temperature and store in air tight tins.

Making Potato chips

1. Wash and peel potatoes. Cut in thin round slices.
2. Put in boiling water for 3-4 minutes.
3. Make a solution in cold water with 4 tsp salt, $\frac{3}{4}$ tsp potassium metabisulphite (for 4 kg potato).
4. Put the blanched potato chips in this solution for 10 minutes.
5. Spread each chip separately on a plate in the sun. Cover with a thin cloth.
6. When dry, cool and store in air tight containers.



So, even if the basic principle of dehydration remains the same, you have to adapt the method depending on the food you are preserving.

(i) Lowering Temperature

Using low temperature to preserve foods works on the principle that low temperature slows microbial and enzyme action. The food is thus prevented from spoilage. Are you using this method of preservation at home? Yes, if you have a refrigerator you can use it because a refrigerator works on this principle. Foods can be preserved at low temperature by:-

- | | | |
|-----|---------------|------------------|
| (1) | Refrigeration | 4° C to 7° C |
| (2) | Cold storage | – 1° C to – 4° C |
| (3) | Freezing | –18°C or below |

The duration for which the food can be preserved by using low temperature varies with the type of food and the temperatures. The lower the temperature, longer is the duration for which food can be preserved. Of the three methods, freezing uses the lowest temperature.

Since cold storage and freezing are both not used very commonly at home as methods of preservation, we will not discuss the details in this section. You have already learnt about refrigeration in a previous lesson.

Freezing of Peas

Method

- Step 1: Select about half a kilogram of fresh, tender peas and shell them.
- Step 2: Take enough water in a stainless steel pan in which the peas can be completely immersed. Add 1 teaspoon of salt for half litre of water, dissolve and bring the solution to boil.
- Step 3: Completely immerse the peas in the boiling solution for about 2 minutes.
- Step 4: Drain the peas immediately on to a stainless steel sieve and let it cool for 10-15 minutes.
- Step 5: Pack the peas in polythene bags, remove the air by pressing and seal the bags.
- Step 6: Put the packets of peas into a freezer.

Note: Similarly other vegetables such as cauliflower, beans, carrots etc can also be frozen.

Using Frozen Vegetables

1. Take out the frozen packet from the freezer one and a half hours or two hours before use and let it thaw to room temperature. Put peas in a sieve and keep under tap water for a few minutes. Drain and use.
2. Frozen vegetables can be stored up to six months in a freezer.

Precautions while freezing Fruits and Vegetables

1. Packaging material, that is, polythene bags should be strong enough to withstand expansion of food material on freezing.
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2. The food once brought out of the freezer and up to room temperature should not be refrozen.
3. Small packets should be prepared, as food once thawed must be consumed. So there is less chance of the unrequired food material being spoiled. This also helps to avoid refreezing of the unutilized food material.
4. Exclude the air carefully and completely from the package before sealing.
5. The freezer should not be opened too frequently.

Thaw: A process by which something frozen is brought to room temperature without applying artificial heat.

(iii) Increasing Temperature

By increasing the temperature, enzymes and micro organisms are destroyed, leaving the food safe from spoilage. Do all organisms get killed by increasing temperature? No, there are some micro-organisms which do not get destroyed at high temperature. If these organisms are not killed, they can spoil food items once the temperature is lowered. There are mainly two methods of preserving foods by using high temperature-

- (1) pasteurization
 - (2) sterilization
- (1) **Pasteurization:** When you think of pasteurization, which food item comes to your mind? Yes, its milk. We have often heard about pasteurized milk packets. In this method food is heated to a high temperature and then quickly cooled. The micro-organisms are not able to withstand the sudden change in temperature and are destroyed. However, some organisms still survive this method.
 - (2) **Sterilization:** What does the word sterilization mean? It means free from any living organism. The high temperature used in this method destroys all the micro-organisms in the food. The foods are exposed to high temperature for longer time and in some cases under pressure.

When a pressure cooker is used to cook, the food lasts longer because most micro-organisms get destroyed. You can also sterilize bottles and other equipments used in preservation.

5.3 INTEXT QUESTIONS

1. Fill in the blank using appropriate words
 - (1) Papad is an example of preservation by
 - (2) Refrigeration reduces the activity of and
 - (3) Dehydration is based on the principle of removal of
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2. Write down the steps you will follow to preserve cauliflower by the dehydration method.
 3. Write down the steps you will follow to preserve bitter gourd (*karela*) by the dehydration method.
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(iv) Using Preservatives

What are preservatives?

Any substance that is added to foods to make it last for a longer time is called a preservative.

You have learnt that increasing the concentration of salt, sugar or acid in a food prevents its spoilage. Therefore, salt, sugar or acid are substances which act as preservatives.

There are two types of preservatives:-

- (1) Natural Preservatives: Salt, sugar, lemon juice, vinegar, oil and spices are natural preservatives.
- (2) Chemical preservatives: Potassium metabisulphate, citric acid and sodium benzoate are chemical preservatives.

Let us discuss the natural preservatives.

- (a) **Salt:** When you make pickle at home, salt is one of the ingredients used. Did you think that salt is added only for taste? Besides adding to taste, salt has a specific function, i.e., to act as a preservative. If the proportion of salt in pickles is less, it can get spoilt after sometime.

How does salt act as a preservative? Increasing the quantity of salt in the food changes its composition. Due to the presence of salt in the food, osmosis takes place. As a result, water comes out of the food. When there is no or less water in the food, the micro organisms are not able to grow and the food becomes safe. Salt also reduces the activity of enzymes, thus preventing the food from getting spoilt.

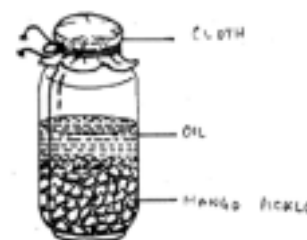
Salt is used as a preservative in pickles, chatni, sauce, canned food, etc. Salt is rubbed on fish which helps to preserve it.

- (b) **Sugar:** Can you think of some preserved foods where sugar is used as a preservative? Yes, these are jams, jellies, murabbas, squashes. Like in pickle, chatni, etc., sugar is added to these foods not only for taste but also as a preservative. The proportion of sugar has to be correct to protect them from spoiling.

How does sugar prevent food spoilage? The sugar dissolves in the water avail-

able in the food item. This results in less water being available for the growth of micro-organisms. Hence the food becomes safe.

- (c) **Acids:** Can you think of any sour food items used as preservative? These are lemon juice, vinegar, citric acid, etc. Vinegar is used to preserve onions, tomato ketchup; lemon juice is used in pickles; citric acid is used in squashes. Acids increase the acidic content of food items, thus preventing the activity and growth of micro-organisms.
- (d) **Oils and spices:** These are used as preservatives in pickles. Can you think of a spice which is commonly used as a preservatives? Yes, mustard powder is one of them. It prevents the growth of micro organisms, thus preventing spoilage. When pickle is made at home, have you observed that oil is poured to cover the mango, lemon or other vegetables which are being pickled. The oil acts as a protective cover and has two advantages-
- prevents contact of micro-organisms with the food, hence they can not spoil the food.
 - prevents contact of air with food, hence the micro organisms can not grow and spoil the food.



You have learnt some of the common methods of food preservation. Generally, a combination of the principles of preservation is used. For example, in pickles you use large amounts of salt, spices and oil. In the same way, acids and a lot of sugar are used for making squashes.

(1) Use of Natural Preservative

Method of making jam

Apple Jam

Ingredients:

Apples: 1 kg

Sugar: 750 gms

Citric Acid: 1 teaspoon

Water: 250 ml

Method:

- Step 1: Select firm apples and wash them thoroughly by rubbing them clean.
- Step 2: Cut them into small pieces. While cutting remove the core and hard seeds, but do not remove skin or peel.
- Step 3: Cook in water till apple pieces are tender. (you can also pressure cook them for 1 whistle only.)
- Step 4: Sieve the pulp carefully.
- Step 5: Add sugar and citric acid with constant stirring.

- Step 6: Cook till the mixture has done the plate test.
- Step 7: Pour hot jam into wide mouthed, sterilized bottles and cool.
- Step 8: Store in a cool place.

Plate Test: Put a spoonful of the cooked mixture on a plate. Let it cool slightly. Tilt the plate. If the jam is ready, the mass moves together as a lump. If liquid separates and pulp remains, it needs more cooking.

(2) Use of Chemical Preservatives

Orange Squash

Ingredients:

Orange juice: 1 litre

Sugar: 2 kgs.

Water: 1 litre

Potassium Metabisulphite: Half teaspoon

Orange Essence: 1 teaspoon

Citric Acid: 30 gms

Method:

- Step 1: Squashes are prepared from juicy fruits. Select juicy oranges and extract the juice.
- Step 2: Take water, sugar and citric and boil the mixture till the sugar is completely dissolved.
- Step 3: Add orange colour, essence and juice.
- Step 4: Dissolve the potassium metabisulphite in a little juice and mix it into the prepared squash.
- Step 5: Pour it into sterilized bottles. Seal it or close it tightly.
- Step 6: Store the bottles in a cool place and away from the sun.

SOME USEFUL TIPS

Let us discuss some tips which will be useful for taking care of the preserved food items.

1. Take care of hygiene while preparing the food and storing it. The utensils and containers used to cook and store food items should be thoroughly cleaned and dried in sun. The containers should have air tight lids.
2. While preserving pickles take care that a layer of oil is above the vegetables, so that these do not come in contact with the air.



3. While using the preserved food items, take care to use clean spoons. Close the lid immediately after removing the required quantity.
4. For foods like sauces and squashes, the bottles should be sterilized and kept in hot water till they are needed. You could first put the preserved food in the bottles and then sterilize the bottles by heating them in water for 30-40 minutes.

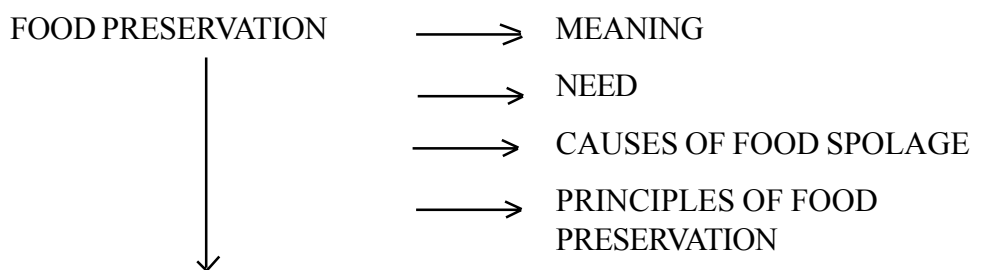


INTEXT QUESTIONS 5.4

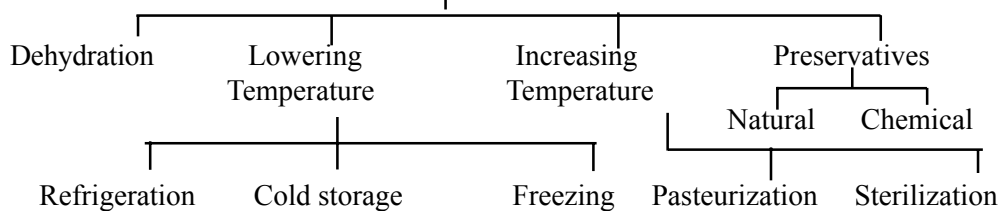
Write T for true and F for false statements give below

- (i) Addition of spices to pickles allows the micro organisms to grow quickly.
- (ii) When making squashes, we make use of any acid and a lot of sugar for preservation.
- (iii) Sterilization increases the activity of enzymes and micro-organisms.

5.8 What You Have Learnt



METHODS OF PRESERVATION AT HOME



5.9 Terminal Exercises

1. Write whether the following statements are true (T) or false (F). Give reasons for your answer.
 - (i) Oranges can be kept for a long time without getting spoilt.
 - (ii) While dehydrating methi leaves these should be put in potassium metabisulphite for 5-10 minutes.
2. Write down the steps in preserving pudina leaves by dehydration method.
3. Match the statements in Column A with those in Column B

Column A	Column B
(a) Natural preservative	(i) potassium metabisulphite
(b) Chemical preservative	(ii) sunlight
(c) Dehydration	(iii) removing micro organisms
(d) Increasing temperature	(iv) salt
	(v) removing enzymes

5.10 Answers to Intext Questions

- 5.1**
- spoiled
 - Colour, taste
 - (iii), (iv)
- 5.2**
- enzymes (ii) micro-organisms (iii) removal of micro organisms, inactivating enzymes, removal of insects, worms and rats.
- 5.3**
- Dehydration
 - enzymes and micro-organisms
 - moisture
 - Clean and dry the plates and tin for drying and storing cauliflower.
 - Wash and cut cauliflower. Remove stems and any decaying portion.
 - Put the cauliflower pieces in boiling water. Take off when they are a little soft.
 - Take out from water and spread on a clean cloth in the sun. Cover with a thin cloth.
 - When pieces are dry, cool and store in tins.
 - Answer is the same as for no 2, except avoid step (iv)
- 5.4**
- False
 - True
 - False
-