

*Notes*

VALUE ADDED FOOD PRODUCTS

Value addition is the process of transforming a raw commodity into a high-quality end product. In the case of food products, value addition results in the production of highly nutritious products with excellent quality, longer shelf life, and improved food safety. While value addition is often pursued for profit, it is also undertaken to improve the nutritional quality of food products. This process can be as simple as grading fruits and vegetables by size and packaging them uniquely, or as complex as transforming them into jams, jellies, chutneys, squashes, etc.

In this lesson, we will learn about the importance of value addition in foods, as well as various value added food products derived from fruits, vegetables, cereals, and milk.



LEARNING OUTCOMES

After studying this lesson, the learner:

- defines the value addition;
- lists the different methods used for value addition of foods;
- explains the value addition of fruits and vegetables and different value added products;
- describes the value addition of cereals and various value added cereal products; and
- outlines value addition in milk and different value added dairy products.

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Notes**18.1 VALUE ADDITION**

A value added food product refers to any product that has been subjected to additional processing or been combined with other products/components to increase its overall value. Value added food products have been modified or enhanced to have a higher market value and a longer shelf life.

18.1.1 Importance

The importance of value addition in case of different food products can be understood through the following points:

- Provides profitability to farmers and financial stability to farmers
- Increases employment opportunities
- Offers better quality, safe, and branded foods to consumers
- Promotes primary and secondary processing industries
- Reduces post-harvest losses
- Reduces imports and meets export demands
- Enhances foreign exchange opportunities
- Encourages the growth of the dairy industry
- Reduces the economic risks associated with marketing

18.1.2 Range of Value Added Food Products

- Fruits and vegetables are processed into a variety of food products, such as juices and concentrates, pulp, canned and dehydrated products, jams and jellies, marmalades, pickles, and chutneys, etc. The extent of processing of fruits and vegetables varies from one country to another.
- Value added cereal products include biscuits, corn flakes, bread, pasta, noodles, and other bakery products, milled products.
- Value addition in milk boosts the economy of the farmers and the dairy industry, simultaneously. This is done by processing milk into products like pasteurized milk, sterilized milk, khoa, paneer, ghee, cheese, yogurt, ice cream, butter, and other dairy items, etc.

Similarly, value addition in case of other food products, such as meat, fish, and poultry, when coupled with effective marketing, has the potential to reduce agricultural wastage, create jobs, and ensure better prices for producers.

**ACTIVITY 18.1**

Collect various value added food products. Group them based on their sources.

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*Notes***18.2 TECHNIQUES FOR VALUE ADDITION OF FOOD PRODUCTS****18.2.1 Food Fortification**

Fortification of foods means the process of improving the nutritional quality of food by adding essential vitamins and minerals (micronutrients). The objectives of food fortification are to:

- Improve the nutritional value of food products.
- Address health issues caused by nutrient deficiencies.
- Provide a variety of food products with improved nutritional profiles.
- Restore nutrients lost during food processing.
- Add nutrients that may not be naturally present in the food.

The methods of food fortification are divided into four types. They are named according to the method used for fortification.

- Bio-fortification
- Industrial fortification
- Synthetic fortification
- Home fortification

18.2.1.1 Bio-fortification

This technique involves the genetic modification of crops or conventional breeding of

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crops to increase their micronutrient content. For example, “Golden Rice” is a bio-fortified crop that contains higher levels of iron and beta-carotene compared to normal rice. This technique has gained more attention in recent years.

Advantages

- A large group of the population gets benefitted from this technique.
- It requires minimal changes to existing practices.

Disadvantages

- Strict food regulations and strict quality control are required.
- Sensory changes in the food products may be unappealing to consumers.

18.2.1.2 Industrial Fortification

This method of fortification improves the nutritional quality of industrially processed and widely consumed edible food products such as flour, oils, rice, butter, sauces, etc.

Advantages

- Food products can be made available at cheap prices.
- Restores the micro-nutrients lost during processing
- It does not interfere with the natural state of plant and animal species.

Disadvantages

- Some people are too far from the markets to purchase food products.

18.2.1.3 Synthetic Food Fortification

This method of fortification involves the addition of probiotic bacteria such as lactic acid bacteria, to food products to improve their nutritional quality.

Advantages

- It requires minimal changes to existing food products.

Disadvantages

- Sensory changes in the food products may make it less appealing to consumers.



18.2.1.4 Home Fortification

Home fortification involves providing micronutrients in packages or tablets that can be added when cooking or consuming meals at home, such as vitamin D drops. This method of food fortification can improve the diet of young children.

Advantages

- Does not alter the natural state of plant or animal species
- Inexpensive to distribute

Disadvantages

- Requires proper knowledge about food ingredients and their use
- Some people may feel uncomfortable adding a substance to their food without understanding its purpose.

18.2.2 Food Enrichment

An enriched food is a type of food that has been fortified with additional nutrients. These nutrients were originally present in the food, but were lost during the processing stages. For instance, white bread is a commonly consumed enriched food, where certain vitamins are added during the refining process, thereby improving its nutritional value.

Difference between Food Enrichment and Fortification

Food enrichment is the addition of micronutrients lost during processing, while food fortification is the process of improving the nutritional quality of food by adding essential micronutrients that may or may not have been present in the original product.

18.2.3 Packaging

Packaging plays a key role in preserving the quality of processed food products and improving their shelf life, presentation, and marketability. Although food packaging (Fig. 4.1) does not directly contribute to value addition in food products, it helps to maintain their existing quality. Additionally, the materials used for packaging should not have any adverse effect on product quality or safety.

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Fig. 18.1 Food Packaging

18.2.4 Innovation

By using innovative techniques, new food products can be developed with improved shelf life, better food quality, and increased safety.

18.2.5 Preservation

Certain forms of preservation can also help maintain the nutritional quality of food products. For example, freezing or canning can preserve some of the nutrients in the food.

**INTEXT QUESTIONS 18.1**

1. Fortification of foods means enhancing the of foods by adding vitamins and minerals.
2. Different methods of food fortification are.....
3. Bio-fortification includes techniques like and
4. Synthetic food fortification involves the addition of to food products.

**ACTIVITY 18.2**

List any three fortified foods. Identify the nutrients that are fortified.

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*Notes***18.3 VALUE ADDED PRODUCTS OF FRUITS AND VEGETABLES**

Value addition in fruit and vegetable processing refers to transforming raw commodities into processed products through the use of raw materials, labor, time, and technology in a way that increases economic returns. Typical value addition techniques for fruits and vegetables include cleaning, cutting, drying, packaging, and freezing. Examples of value added products from fruits and vegetables include:

- Pulp
- Juices and concentrates
- Canned and dehydrated products
- Jams and jellies
- Pickles, chutneys, etc.

The concept of value addition in fruits and vegetables is a strategy to reduce post-harvest losses of fresh produce, extend the storage period, and ensure the availability of fruits and vegetables during off-seasons.

18.3.1 Preparation and Preservation of Juice Products

Fruit juices (Fig. 18.2) have their best taste, aroma, and color when freshly extracted. The most important steps in processing fruit juices are

- (i) Selection and preparation of fruit
- (ii) Extraction of juice
- (iii) Deaeration
- (iv) Straining, filtration, and clarification

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(v) Preservation

All fruits are not suitable for making fruit juice, either because of difficulties in juice extraction or because the resulting juice is of poor quality. Fruits or vegetables have to be thoroughly cleaned to remove any dirt or insecticide residues. The method of juice extraction will vary depending on the structure and composition of the fruit. Before pressing, most fruits are crushed to facilitate extraction.

The extraction of juice should be done as quickly as possible, and the juice should be exposed to the open air as little as possible. Fruit juice contains some air, which is either present on the surface or dissolved within the juice. After extraction, the juice is strained and filtered to remove seeds, pulp, gums, pectic substances, and proteins in colloidal suspensions. The clarification of juice (complete removal of all suspended materials from the juice) can be performed by methods such as centrifugation, enzyme treatment, settling, filtration, freezing (-18°C), high temperature (nearly 82°C), and low temperature (-2 to -3°C).



Fig. 18.2 Fruit Juice

18.3.2 Fruit Beverages

Synthetic drinks contain only water (about 88%) and carbohydrates (about 12%) and provide about 48 kcal per 100 ml. In contrast, fruit-based drinks contain vitamins (A, B, and C) and minerals (iron, calcium, etc.) and provide more calories. Fruit beverages are easily digestible, highly refreshing, thirst-quenching, appetizing, and nutritionally far superior to many synthetic and aerated drinks. They can be classified into two categories: unfermented and fermented beverages.



18.3.2.1 Unfermented Beverages

Fruit juices that do not undergo alcoholic fermentation are referred as unfermented beverages. They include RTS (ready-to-serve) drinks, nectar, cordial, squash, crush, syrup, fruit juice concentrate, fruit juice powder, as well as barley water and carbonated beverages.

1. Juices

Juices may be natural, sweetened or blended.

- ❖ **Natural juice (pure juice):** It is the juice extracted from ripe fruits and contains only natural sugars.
- ❖ **Sweetened juice:** It is a liquid product containing at least 85% juice and 10% total soluble solids.
- ❖ **Blended juices:** These are made by mixing two or more juices to create a well-balanced, rightly flavored, highly palatable and refreshing drink.

2. Ready-to-serve

This is a type of fruit beverage that contains at least 10% fruit juice and 10% total soluble solids, and approximately 0.3% acid. It is called ready-to-serve (RTS) because it does not require dilution before consumption (Fig. 18.3).



Fig. 18.3 Ready to serve beverage (RTS)

3. Squash

This is a type of fruit beverage that contains at least 25% fruit juice or pulp and 40 to 50% total soluble solids. The squash contains added citric acid, sucrose, and preservatives (Sodium Benzoate or KMS). It must be diluted before serving.

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18.3.2.2 Fermented Beverages

Fermented beverages are fruit juices that have undergone alcoholic fermentation by yeasts. Examples include wine and champagne (from grapes), port, sherry (Spanish wine), tokay, muscat, perry (from pears), orange wine, berry wine (from fruits like strawberry, blackberry), nira (from juice of the palm tree), feni (from cashew apple), and cider (from apple, bael, jamun, phalsa and, aonla).

1. Wine

Wine (Fig. 18.4) is a fermented alcoholic beverage made from grape juice without distillation. Wines are categorized based on alcohol content:

- ❖ Light wines: 7 to 9% alcohol
- ❖ Medium wines: 9 to 16% alcohol
- ❖ Strong wines: 16 to 21% alcohol

Sparkling wines contain carbon dioxide, while still wines do not. Fortified wines contain added alcohol in the form of brandy. Brandy is prepared by distillation of wine.



Fig. 18.4 Wine

18.3.3 Jam

Jam is a semi-solid food product prepared by cooking sugar with fruit or vegetable pulp, pectin, acid, and other ingredients to achieve the desired consistency. Jam should contain 68% solids and 45g of fruit pulp per 100g of jam. It can be prepared from one type of fruit or from two or more types. Common fruits used in jam preparation include apple, pear, sapota, apricot, loquat, peach, papaya, carrot, strawberry, mango, grapes, pineapple, etc.

Generally the fruit pulp is cooked with the required quantities of sugar and pectin, and the desired amount of citric acid is then added. The end-point is judged by either TSS (68%), boiling point (105°C), or the sheet test. The product is hot-filled into sterile bottles, followed by cooling, waxing, and capping. The final product is stored at room temperature.

18.3.4 Fruit Preserve (Murabba)

These are made from mature, under-ripe fruits by cooking large cut pieces or small whole fruits in heavy syrup until they become tender and transparent. The procedure includes peeling, puncturing (to promote sugar penetration), blanching (to inactivate enzymes), and chemical treatment, followed by the addition of sugar concentrate.

18.3.5 Pickles

Pickles (Fig. 18.5) are good appetizers that enhance the palatability of meals. Pickles are edible product preserved in a solution of common salt and vinegar.

Pickles can be prepared from fruits and vegetables such as lemon, aonla, mango, onion, cauliflower, cabbage, cucumber, bitter gourd, jackfruit, turnip, etc. Fruits are generally preserved in sweetened and spiced vinegar, while vegetables are preserved in salt.



Fig. 18.5 Pickles

- **Preservation with salt:** This method of preservation is generally used only for vegetables that contain very little sugar. The method involves adding salt to the prepared material, such as mangoes, and leaving the mixture in the sun for one week with shaking twice a day. Then, the required amount of spices is added, and the pickle is stored at an appropriate temperature.



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- **Preservation with vinegar:** In this method, vegetables are preserved in vinegar until they reach a final concentration of 2-3% acetic acid (not less than 2%) for preservation. In vinegar pickles, salt (2-3%) and sometimes sugar (2-5%) are also added. Garlic, chillies, etc., are preserved in vinegar as such.
- **Preservation with oil:** The fruits or vegetables should be completely immersed in edible oil. The pieces of (lemon, cauliflower, turnip, etc.) are mixed with spices and salt. The mix is kept in the sun for 4-6 days, then oil is added to the mix.
- **Preservation with salt, vinegar, oil and spices:** Pickles can also be preserved by combining salt, vinegar, oil, and spices, such as in mango pickles.

18.3.6 Chutneys

A chutney is essentially a mixture containing fruit or vegetables, spices, salt and/or sugar, vinegar. The method of preparation is similar to that of jams, except that spices and vinegar are added. Ripe fruits/vegetables are slowly cooked below the boiling point. Onion and garlic are added at the start to mellow their strong flavors. Vinegar, sugar, and spices are added just before the final stage of boiling.

18.3.7 Tomato Products

The quality of tomato products is judged by their color, which is dependent on the redness of tomatoes used. During processing of tomato products, avoid prolonged heating and cool the product quickly after preparation.

i. Tomato Juice

Good quality juice should have a deep red color, possess the characteristic taste and flavor of tomatoes, uniform appearance, and high nutritive value. It should contain about 0.4% acid (in terms of citric acid), 0.5% salt, and 1% sugar.

ii. Tomato Puree

Skinless and seedless tomato pulp, with or without added salt, containing not less than 9% of salt-free tomato solids is known as “Medium Tomato Puree”. It can be further concentrated to create “Heavy Tomato Puree”, which contains not less than 12% solids.

iii. Tomato Paste

Tomato paste is similar to tomato puree but has a higher solid concentration. It is prepared by concentrating tomato juice through evaporation under vacuum. Tomato paste contains not less than 25% tomato solids, while “concentrated tomato paste” contains not less than 33% tomato solids.

iv. Tomato Sauce and Ketchup

Tomato sauce and ketchup are essentially the same, but sauces are generally thinner and contain more total solids (minimum 30%) than ketchups (minimum 28%). They are made with strained tomato juice or pulp, spices, salt, sugar, and vinegar, with or without onion and garlic, and contain not less than 12% tomato solids and 25% total solids.

Tomato ketchup is a condiment that is made by concentrating tomato paste with water, sugar, vinegar, salt, and seasonings.

*Notes***18.3.8 Drying**

Drying is the most popular method of food preservation. It removes water from the surface of the food through the combined effects of air flow, temperature, and humidity. Fruits and vegetables are dried to such an extent that their moisture content is reduced, which prevents the growth of microorganisms and inhibits the action of enzymes. Dehydrated fruit may contain 12-14% water, while vegetables should be dried to 4-8% water content, depending on the type, as they contain less sugar.

**INTEXT QUESTIONS 18.2**

1. What is value addition?
.....
.....
2. The most important steps in processing fruit juices are.....
.....
3. Different methods used for juice clarification are.....
.....

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4. Fruit juices which do not undergo alcoholic fermentation are termed as.....
5. is a liquid product which contains at least 85% juice and 10% total soluble solids.
6. A fruit beverage which is not diluted before serving is known as.....
7. is a fermented alcoholic beverage produced from grape juice without distillation.
8. Tomato juice is concentrated to not less than tomato solids in the case of tomato paste.

**ACTIVITY 18.3**

Identify and gather five value-added products made from fruits and vegetables. Examine and analyze the processes involved in enhancing their value.

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18.4 VALUE ADDED PRODUCTS FROM CEREALS

Value addition is a process by which cereal grains are modified to enhance their value and appeal to consumers. The various value added products derived from cereals are explained below:

18.4.1 Value Added Rice Products**a) Instant Rice (Quick-cooking Rice)**

Instant rice is prepared by dehydrating cooked rice to create a porous structure in the finished product. The cooked rice is first dehydrated in an air dryer and then subjected to a puffing treatment.

b) Puffed Rice from Paddy

To produce puffed rice, paddy is first soaked in water until its moisture content reaches about 20%. The moist paddy is then exposed to sudden heat treatment at 250-270°C for 30-40 seconds. This causes the husk to split off and the rice to puff up.



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c) Rice Flakes (beaten Rice)

The rice is soaked in hot water (70-80°C) for 20 minutes. Thereafter the water is drained off, and the soaked rice is toasted in a pan at about 250-275°C until a few grains start puffing. The toasted rice is immediately subjected to flaking.

d) Rice Flour

Rice flour is added to other ingredients to enhance their utility. For example, adding rice flour to gram flour during the preparation of *pakoras* improves crispiness.

18.4.2 Value Added Wheat Products

Wheat is unique among other cereal flours as it has the ability to form dough with water. The various products prepared from wheat flour include *chapatti*, bread, biscuits, cookies, pasta products, and more.

a) Cookies

Cookies (Fig. 18.6) are soft wheat-based chemically-leavened products with high sugar, shortening content (fats like margarine, lard, vegetable oil) and relatively have low water content. The leavening is achieved through carbon dioxide, water or ethanol vapours, ammonia, and air. The most common leavening agent is sodium bicarbonate, which is low cost, non-toxic, easy to handle, and leaves no taste in the final product.



Fig. 18.6 Cookies

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The major steps involved in cookie preparation include:

- ❖ Creaming the fat and powdered sugar to make a fluffy mixture.
- ❖ Sifting together the dry ingredients (flour, salt, and baking powder).
- ❖ Mixing the dry ingredients into the fat-sugar cream mixture with limited water.
- ❖ Forming smooth dough.
- ❖ Sheeting the dough and cutting it with a rotary cutter.
- ❖ Baking at 210°C for 9-10 minutes.

b) Cakes

The cakes differ from cookies in following aspects:

- a) Higher sugar level
- b) The main structural ingredients are fat and eggs.
- c) Tendering agents include sugar and fat.

Cakes are of two types;

- ❖ Shortened cakes (containing butter or fat)
- ❖ Sponge cakes (without fat).

A higher level of gluten is not desirable in cake making. The cakes are baked at 190°C for 30 minutes.

c) Biscuits

In order to prepare biscuits, initially a mixture of five parts flour and one part milk is combined with baking powder, fat, and salt to create a dough.

The procedure includes:

Mixing the ingredients → Kneading the dough for 10-20 minutes to achieve the desired cohesion → Sheeting → cutting the dough to the desired size → Baking at 210-232°C for 15 minutes.

An under-kneaded dough results in biscuits that are very tender, coarse in texture, small in volume, and have a rough crust. The optimum kneading time of 10-20 minutes will give a fine structure, smooth crust, and better appearance. Over-

kneading results in a compact and tough biscuit.

d) Pasta Products

The pasta products (Fig. 18.7) are cost effective, easy to prepare, palatable, versatile, have a long shelf life, and have good nutritional value. The process involves sieving, purifying, and conditioning the dough by adding water, extruding it, and drying it until it reaches moisture content of 2%. The mixing process must be carried out in the absence of air to prevent air bubbles from appearing on the product's surface, otherwise which would result in an opaque appearance. This opaque color interferes with the perception of the yellow color of pasta.



Notes



Fig. 18.7 Pasta



INTEXT QUESTIONS 18.3

1. The moist paddy is puffed by subjecting to sudden heat treatment at°C forseconds.
2. Cookies are baked at°C for minutes.
3. Cakes are of two types..... and

18.5 VALUE ADDED PRODUCTS FROM MILK

Value addition in milk can be a great tool for enhancing the farmer's income and increasing profitability through the use of certain techniques. With rising consumer

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awareness, people are more conscious about healthy diets, which has expanded the market for value added functional dairy products. Some of these value added products are described below:

A. Pasteurized Milk

Pasteurization is the process of heating each and every particle of milk to a suitable temperature below the boiling point for a definite time to destroy all pathogenic microorganisms. Cooling of milk immediately after pasteurization is essential because not all bacteria are killed during the heating process.

Temperature-time combination for LTLT (low temperature long time) is 63°C for 30 minutes. Temperature-time combination for HTST (high temperature short time) is 72°C for 15 seconds.

B. Sterilized Milk

Sterilization is a heat treatment method used to destroy both pathogenic and non-pathogenic microorganisms in milk. The milk is heated above 100°C for a specific time period to ensure that it remains safe for consumption for at least seven days at room temperature.

Generally, the milk is heated at 110°C for 30 minutes or 120°C for 15 minutes. When packaged in sealed bottles and stored at room temperature, sterilized milk can have a shelf-life of over six months. However, sterilization causes more nutritional loss than pasteurization, as vitamins B and C get destroyed during the process.

C. Butter

Butter is a fat concentrate obtained by churning cream, which gathers the fat into a compact mass and then process it further. It is a semi-solid product that contains no less than 76% milk fat and no more than 20% moisture. Butter is usually yellow or white in color, with a bland flavor and a slightly salty taste.

D. Cultured or Fermented Dairy Products

Lactose intolerance is a condition in which individuals cannot digest the sugar (lactose) in milk. However, fermented dairy products such as yogurt allow those with lactose intolerance to consume milk, as the fermentation process breaks down the lactose.

Fermented milk products such as yogurt and sour milk contain *Lactobacilli* bacteria, which naturally occur in the digestive tract and have a cleansing and healing effect. Introducing these products into the diet can help prevent the growth of certain harmful yeasts and bacteria that may cause illness.

The technology of cultured milk products, such as yogurt, curd, and cheese, is based on the microbial conversion of lactose to lactic acid, which gives these products their characteristic sourness. Lactic acid-producing bacteria are essential for this conversion process.



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E. Curd (Dahi)

Curd is a fermented milk product obtained by souring pasteurized or boiled milk with lactic acid bacteria inocula.

F. Yoghurt

Yoghurt is a fermented milk product. In the manufacture of yoghurt, milk is typically heated to 70°C for 15-20 minutes, then cooled to 30- 40°C and inoculated with a mixed culture of *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, in a ratio of 1:1.

G. Cheese

Cheese (Fig. 17.8) is produced from milk by the combined action of lactic acid bacteria and the enzyme rennin (also known as rennet). Like cream, which is a concentrated form of milk fat, cheese is a concentrated form of milk protein. Hard cheese should contain no more than 43% moisture and no less than 42% milk solids in the dry matter.

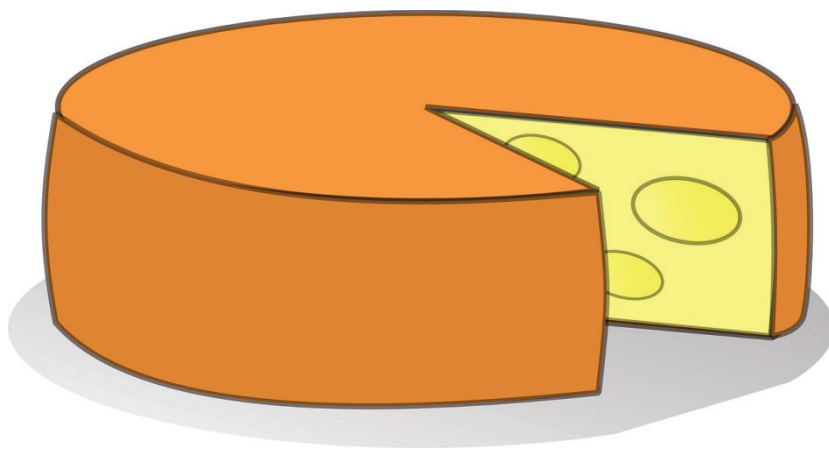


Fig. 18.8 Cheese

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H. Ice Cream

Ice cream is a frozen dairy product made from milk, sugar, fat, and optional stabilizers, colors, and flavors. The product may include permitted stabilizers and emulsifiers that do not exceed 0.5% of its weight. The mixture must be heated sufficiently before freezing to destroy all pathogenic bacteria. Ice cream should contain at least 10% milk fat, 3.5% protein, and 36% total solids.

I. Dehydrated Milk Powder

Powdered milk is produced by evaporating liquid milk until it becomes dry. Drying of milk extends its shelf life and eliminates the need for refrigeration due to its low moisture content. Additionally, it reduces bulk, making transportation more economical. Types of milk powders include whole milk powder, non-fat dry milk, buttermilk powder, whey products, and dairy blends.

**INTEXT QUESTIONS 18.4**

1. Temperature-time combination for LTLT (low temperature, long time) pasteurization of milk is.....
2. is the heat treatment of milk to destroy both pathogenic and non-pathogenic micro-organisms.
3.may be defined as a fat concentrate obtained by churning cream and gathering the fat into a compact mass.
4. Fermented-milk products such as yoghurt, contain bacteria from the group.
5. Cheese is made from milk by the combined action of..... bacteria and the enzyme.....

**WHAT YOU HAVE LEARNT**

- Value addition leads to the production of highly nutritious products with excellent quality, shelf life, and food safety.
- Food enrichment involves adding micronutrients lost during processing, back into the food product.

- The concept of value addition for fruits and vegetables is aimed at increasing their storage life and ensuring availability during off-seasons.
- Juices can be natural, sweetened, or blended.
- Jam is a semi-solid food product made by cooking sugar with fruit or vegetable pulp, pectin, acid, and other ingredients to create a specific consistency.
- The quality of tomato products depends on the redness of the tomatoes used.
- Cookies, cakes, biscuits, and pasta are value-added wheat products that undergo specific processes for their production and development.
- Value addition in milk can be a great tool for enhancing farmers' income and increasing profit by using certain techniques.



Notes



TERMINAL QUESTIONS

1. What are the differences between pasteurization and sterilization?
2. Differentiate between fortification and food enrichment.
3. What is the importance of adding value to foods?
4. Explain the different methods of food fortification.
5. What are the advantages and disadvantages of each method of food fortification?
6. How can we prepare and preserve fruit juice products?
7. What is the difference between fermented and unfermented beverages?
8. How is fruit preserve prepared?
9. Explain the preservation of pickles with vinegar.
10. Differentiate between puffed rice and instant rice.
11. How are cookies prepared?
12. Why is mixing of pasta done under vacuum?
13. How is sterilized milk prepared?
14. How is ice cream prepared?
15. What is the composition of butter?

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Notes**ANSWERS TO INTEXT QUESTIONS****18.1**

1. Nutritional quality
2. Bio-fortification; industrial fortification; synthetic fortification; home fortification
3. Genetic modification, conventional breeding
4. Probiotic bacteria

18.2

1. Value addition is the transformation of a raw commodity or commodities into a processed product through the use of raw materials, labour, time and technology in such a way that assures increased economic return.
2. Selection and preparation of fruit, extraction of juice, deaeration, straining, filtration, clarification and preservation.
3. Centrifugation, enzyme treatment, settling, filtration, freezing (-18°C), use of high temperature (nearly 82°C) and low temperature (-2 to -3°C).
4. Unfermented beverages
5. Sweetened juice
6. Ready to serve
7. Wine
8. 25%

18.3

1. 250-270, 30-40
2. 210, 9-10
3. Shortened, sponge



18.4

1. 63°C/30 min
2. Sterilization
3. Butter
4. *Lactobacilli*
5. Lactic acid, rennin

GLOSSARY

Value added product: A value added product refers to any product that has been undergone additional processes or combined with extra products to increase its overall value and quality.

Dough: Dough is a semi solid mixture of flour, water and other ingredients like sugar, salt, leavening agents and flavours.

Chemical leavening: It is a process where a special compound (leavening agent like baking powder) is added to dough to release gas upon reacting with heat or moisture. This gas increases the volume of the baked product.

Fruit beverage: Fruit beverages are easily digestible and nutritionally rich fruit based drinks.

Jam: Jam is a semi-solid food product prepared by cooking sugar with fruit or vegetable pulp. It should contain 68% solids.

SUGGESTED READINGS

1. *Processing of Horticultural Crops*, B.Sc. (Horticulture), e-KrishiShiksha, Agricultural Education Division, Indian Council of Agricultural Research, New Delhi (<https://ecourses.icar.gov.in/>).
2. *Value addition*, TNAU Agritech Portal, Tamil Nadu Agricultural University, Coimbatore. (http://www.agritech.tnau.ac.in/horticulture/horti_valueaddition.html)

WHAT YOU HAVE LEARNT

