FOOD SCIENCE AND TECHNOLOGY

Standard XII

The Constitution of India

Chapter IV A

Fundamental Duties

ARTICLE 51A

Fundamental Duties- It shall be the duty of every citizen of India–

(a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;

(b) to cherish and follow the noble ideals which inspired our national struggle for freedom;

(c) to uphold and protect the sovereignty, unity and integrity of India;

(d) to defend the country and render national service when called upon to do so;

(e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities, to renounce practices derogatory to the dignity of women;

(f) to value and preserve the rich heritage of our composite culture;

(g) to protect and improve the natural environment including forests, lakes, rivers and wild life and to have compassion for living creatures;

(h) to develop the scientific temper, humanism and the spirit of inquiry and reform;

(i) to safeguard public property and to abjure violence;

(j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;

(k) who is a parent or guardian to provide opportunities for education to his child or, as the case may be, ward between the age of six and fourteen years.

The Coordination Committee formed by GR No. Abhyas - 2116/(Pra.Kra.43/16) SD - 4 Dated 25.04.2016 has given approval to prescribe this textbook in its meeting held on 30.01.2020 and it has been decided to implement it from academic year 2020-21.

Food Science and Technology

STANDARD TWELVE

I5K7D2

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The Constitution of India

Preamble

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation;

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

NATIONAL ANTHEM

Jana-gana-mana-adhināyaka jaya hē
Bhārata-bhāgya-vidhātā,

Panjāba-Sindhu-Gujarāta-Marāthā
Drāvida-Utkala-Banga

Vindhya-Himāchala-Yamunā-Gangā
uchchala-jaladhi-taranga

Tava subha nāmē jāgē, tava subha āsisa māgē,
gāhē tava jaya-gāthā,

Jana-gana-mangala-dāyaka jaya hē
Bhārata-bhāgya-vidhātā,

Jaya hē, Jaya hē, Jaya hē,
Jaya jaya jaya, jaya hē.

PLEDGE

India is my country. All Indians are my brothers and sisters.

I love my country, and I am proud of its rich and varied heritage. I shall always strive to be worthy of it.

I shall give my parents, teachers and all elders respect, and treat everyone with courtesy.

To my country and my people, I pledge my devotion. In their well-being and prosperity alone lies my happiness.

Preface

Dear Students,

It is a matter of pleasure and pride to place this exposition on food science and technology book in the hand of the young generation. This textbook aims to create awareness about the food science and technology as food processing industry is highly significant for India's development because of vital linkages and synergies, it promotes between the two pillars of our economy, industry and agriculture. In India, the food sector has emerged as high growth and high profit sector due to its immense potential for value addition particularly within the food processing industry.

This book is designed for the food science and technology students and offers the learner tremendous scope for life skill development. The National Curriculum Framework (NCF) was formulated in 2005 and the State Curriculum Framework (SCF) in 2010. Based on the given these two frameworks, reconstruction of the curriculum and preparation of a revised syllabus has been undertaken which will be introduced from the academic year 2020-21. The textbook incorporating the revised syllabus has been prepared and designed by the Maharashtra State Bureau of Textbook Production and Curriculum Research, (Balbharti), Pune.

The new syllabus of food science and technology for Std. XII specifically focuses on the application of conceptual principles learned in Std. XI related to food processing sectors.

The textbook comprises 5 units with 12 chapters. The unit-1 and unit-2 more effectively tells about technology behind industrial food products like, milk and animal based products, beverages, bakery and confectionery products. Unit-3 deals with community nutrition, which will add to the knowledge of students about nutritional status and diet therapy for achieving good health through nutrition. Looking at the urgent need of food safety, to make the students aware unit-4 is dedicated for study related to food adulteration and its detection, knowledge about national and international food laws and regulations, and food waste management system. Being an important category of food industry, food service industry has been covered in unit-5.

The curriculum and syllabus confirm to the maxims of teaching such as moving from simple to complex, concrete to abstract, known to unknown and from part to whole.

Throughout the book, for quick understanding of concept in a constructive manner and grasping the matter, a better descriptive approach with numerous tables, figures, photographs and illustrations is used. For the first time in syllabus of food science and technology various independent activity have been introduced which not only help to comprehend the content but also understand its application. QR codes have been introduced for gaining the additional information about abstract of chapters and practice question/activities.

The efforts taken to prepare the textbook will not only enrich the learning experiences of the students, but also benefit other stakeholders such as teachers, parents, food entrepreneurs as well as candidates aspiring for the competitive examination.

We look forward to a positive response from the teachers and students.

Our best wishes to all !

(Vivek Gosavi)
Director
Maharashtra State Bureau of Textbook
Production and Curriculum Research, Pune

Pune
Date: 21 February 2020
Bhartiya Saur : 2 Phalguna 1941

For Teachers

Dear Teachers,

We are happy to introduce the textbook of Food Science and Technology for Std XII. This book is a sincere attempt to follow the maxims of teaching as well as develop a 'constructive' approach to enhance the quality of learning. The demand for more activity based, experiential and innovative learning opportunities is the need of the hour. The present curriculum has been restructured so as to bridge the credibility gap that exists between what is taught and what students learn from direct experience in the outside world. Guidelines provided below will help to enrich the teaching-learning process and achieve the desired learning outcomes.

- To begin with, get familiar with the textbook yourself.
- The present book has been prepared for constructive and activity-based teaching.
- Teachers must skillfully plan and organize the activities provided in each chapter to develop interest as well as to stimulate the thought process among the students.
- Always teach with proper planning.
- Use teaching aids as required for the proper understanding of the subject.
- Do not finish the chapter in short.
- Follow the order of the chapters strictly as listed in the contents because the units are introduced in a graded manner to facilitate knowledge building.
- Facilitate peer learning as much as possible by reorganizing the class structure frequently.
- Teaching-learning interactions, processes and participations of all students are very essential and so is your active guidance.
- Ask questions based on previous knowledge of different concepts of lesson.
- Do not use the boxes titled 'Do you know?' for evaluation. However, teachers must ensure that students read this extra information.
- Information provided in boxes and points to remember should be considered for evaluation.
- Exercises provided after each unit are prepared using different parameters like observation, co-relation, critical thinking, analytical reasoning etc.
- Evaluation pattern should be based on the above mentioned parameters. Equal weightage should be assigned to all the topics. Use different combinations of questions. Stereotype questions should be avoided.
- Use demonstration, discussion method for teaching.
- Use QR Code given in the textbook. Keep checking the QR Code for updated information.
- 'Activity' is used in lesson and exercise for better understanding and application of the content which studied.
- Exercise is given at the end of lesson. In exercise different type of questions/ activities are given.
- Teacher should use their freedom to acquaint the students with different food products and recipies of given region.
- Remember that mathematical and statistical tools are also important to understand Food Science and Technology.
- Glossary, brief definitions and abbreviations are provided towards the end of the textbook for further clarification.

Best wishes for a wonderful teaching experience and fruitful welcome!

Competency Statements
Standard XII

Unit	**Competency Statements** **After studying, the content in textbook students will…**
Food Product Technology	• Be able to categorize the industrial food products into sectors like milk products, animal products and beverages • Explain the compositional difference between these three types of products • Elaborate different processes and techniques used for manufacturing these products
Bakery and Confectionery Technology	• Define different bakery and confectionery products • Understand the role of ingredients in developing quality product • Describe the manufacturing process for bakery and confectionery products
Community Nutrition	• Become aware about nutritional status and health • Be able to conduct nutritional assessment of nutritional status • Explain about importance of diet therapy in community nutrition
Food Safety Management	• Understand the need of food safety management system • Create awareness about food adulteration in society • Enlist different national and international standards applicable to food products to maintain food safety throughout in food chain • Be able to categorize food waste, and dispose or utilize it accordingly
Food Service Management	• Understand the food service industry • Elaborate the workplace, personnel and menu management in food service industry • Acquire knowledge about Indian cuisine and types of gravies • Become aware about instruments and different techniques used in Indian cookery

Contents

UNIT 1
Food Product Technology

Objectives

- To know the chemical composition of milk.
- To understand processing of milk and various milk products.
- To understand need and importance of livestock, egg, fish and poultry.
- To study structure, composition and nutritional quality of animal products.

The food products are generally obtained from two major sources: animal kingdom and plant kingdom by the use of technology.

Milk is considered a complete food from the times of our ancestors. It is a widely consumed beverage that is essential to the diet because it provides complete food nutrient including important macro- and micro-nutrients. Owing to its high perishable nature, it is required to process into various value added products having high nutritional value with longer shelf life.

Man has been using meat, fish, poultry and eggs in his diet since time immemorial. Meat is an animal flesh that is eaten as food. Meat and meat products can provide an important nutritional contribution to the human diet. They are rich and concentrated sources of nutrients including fats, proteins, vitamins and minerals, etc. Eggs are one of the few foods that are classified as "superfoods." They are loaded with nutrients, some of which are rare in the modern diet. Poultry are domesticated birds raised for food. Fish is a high-protein, low-fat food that provides a range of health benefits.

Beverage is any liquid consumed by humans for quenching their thirst, meeting food requirements or merely for pleasure.

1 Milk and Milk Products

Contents

Milk is the biological liquid secreted by mammary gland of mammals. All mammals, including humans, normally produce milk to feed their offspring until they are ready for consuming solid food. Cow is the principal sources of milk for human consumption in many parts of the world. Other important sources of animal milk are buffalo, goat, sheep, camel etc. India is the largest producer of milk.

Milk contains valuable nutrients and offers a range of health benefits. It is regarded as a complete food because of its rich source of nutrients such as protein, fat, carbohydrates, vitamins and minerals, essential for sustaining life and maintaining good health.

Do you know ?

Milk is good for bones because it offers a rich source of calcium which is essential mineral for healthy bones and teeth. Cow's milk is fortified with vitamin D, which also benefits bone health. Calcium and vitamin D helps to prevent osteoporosis. That is how milk is considered as 'complete food'.

Do you know ?

World Milk Day (1st June) is an international day established by the Food and Agriculture Organization (FAO) of the United Nations to recognize the importance of milk as global food.

Dr. Verghese Kurien, (26 November 1921 to 9 September 2012) known as the 'Father of the White Revolution' in India. He made dairy industry as India's largest self-sustaining dairy industry by using village cooperative movement in Anand, Gujarat. He helped to create rural co-operative model not only for India, but for developing countries throughout the world.

1.1 COMPOSITION OF MILK:

Milk is a complex fluid which contains more than hundred components. Most of these components are suspended in water and thus milk is a colloidal solution and has opaque consistency. The major components of milk are water, protein, fat, carbohydrates, vitamins and minerals. All the solids in milk are referred to as 'total solids' and the total solids without fat are known as milk solids-not-fat (SNF). The composition of milk varies with the species, breed, feed, lactation period and interval between milking. The average nutritional composition of milk of animals and human beings is given in table 1.1.

1.1.1 Water:

Milk contains 81-88 percent water, hence it is in a liquid state. All the constituents are dispersed in water phase which help in their digestion.

1.1.2 Protein:

All milk contain approximately 3-4 percent of protein. The main protein in milk is casein, which accounts for about 80 percent of the total milk protein present. It is a phosphoprotein. The normal pH of milk is 6.6 at which casein is combined with calcium and present in the form of calcium caseinate. The remaining 20 percent proteins of milk are the whey proteins which contain lactalbumin and lactoglobulin.

1.1.3 Fat:

The fat content of milk varies from 3.5 percent in cow's milk to about 6.5 percent in buffalo's milk. The flavour of the milk is due to milk fat. Milk is an oil-in-water emulsion. Fat globules are visible under a microscope. Milk fat absorbs volatile odours readily. Milk contains saturated and unsaturated fatty acids. Yellow colour of cow's milk fat is due to carotene (precursor of vitamin A) content. The price of different types of dairy milk varies according to the fat content. The higher the fat content, the higher is the price of that milk.

1.1.4 Carbohydrates:

Milk contains about 4 to 5 percent carbohydrates. The chief carbohydrate of milk is lactose sugar; a disaccharide composed of two monosaccharide units, i.e. glucose and galactose. Milk is the only source of lactose and no other food contains it, hence lactose is called as milk sugar which gives sweet taste to milk. When milk is heated lactose reacts with protein and develops a brown colour.

Do you know ?

Galactose is called as a brain sugar

Do you know ?

Lactose intolerance is a disorder in which a person lacks the enzyme lactase, which is capable to break down the lactose sugar. People with lactose intolerance are unable to digest the milk sugar as they do not have the enzyme lactose in their digestive system. Soy milk, coconut milk are dairy alternatives for people suffering from lactose intolerance. Animal milk is considered as 'bovine milk', while the milk from seed coconut, soya, almond are referred as vegan milk.

1.1.5 Minerals:

The important minerals present in milk are calcium, phosphorus, sodium, potassium and iodine. The salts of these minerals function are as buffers maintaining the pH of milk at a constant level of about 6.5 to 6.6.

1.1.6 Vitamins:

Milk is a good source of both fat soluble and water soluble vitamins. Milk is especially rich in riboflavin but this vitamin is lost rapidly on exposure to light and may produce an oxidized off flavor. The concentration of niacin and ascorbic acid is relatively low in milk. Some milk do not contain a sufficient amount of vitamin D and this is added in fortified milk to make it enrich with vitamin D.

Table 1.1 Nutritional composition of milk from various sources (per 100 ml)

Composition	Cow	Buffalo	Goat	Human
Water (ml)	87.5	81.0	86.8	88.0
Protein (g)	3.2	4.3	3.3	1.1
Fat (g)	4.1	6.5	4.5	3.4
Carbohydrate (g)	4.4	5.0	4.6	7.4
Energy (Kcal)	67	117	72	65
Calcium (mg)	120	210	170	28
Phosphorus (mg)	90	130	120	11
Carotene (µg)	53	48	55	41
Riboflavin (mg)	0.19	0.10	0.04	0.02

Source: Nutritive value of Indian Foods, National Institute of Nutrition, Hyderabad

Do you know ?

The National Dairy Research Institute (NDRI), Karnal is India's premier institute for dairy research.

1.2 EFFECT OF HEAT, ACID AND ENZYME ON MILK:

1.2.1 Effect of heat:

Heating of milk is done to kill the pathogenic microorganisms and enzymes present in it. The extent of changes depends on the temperature and period of heating. The changes affect the colour, flavor, taste and viscosity of milk. A light brown tinge is developed on prolonged heating of milk. The heat labile whey proteins undergo denaturation and coagulation. Generally, there is scum formation when milk is heated in an uncovered pan or vessel. The scum gets thickened as the temperature is increased e.g. *basundi.*

Milk boils at about 100.2^{0}C. When milk is heated in open vessel, a scum (*malai*) is formed on the top of the milk. This is because of evaporation of water and concentration of casein, which blocks calcium salt and milk fats. Heat also has an adverse effect on the flavour and odour of milk. The 'cooked' flavour of boiled milk is attributed to the loss of dissolved gases (CO_2 and O_2).

1.2.2 Effect of acid:

In milk, casein is present at pH 6.6 as calcium caseinate. When the acidity of milk increases either by the addition of acid or by natural souring, casein is precipitated e.g. curdling. At higher temperature the addition of acid hastens the coagulation of milk proteins. Increase in acidity also hastens coagulation of milk proteins. A very good example of this phenomenon is the preparation of *paneer*, which is prepared by adding lemon juice/citric acid to hot milk, leads to separation of solids (proteins) and liquids (whey).

1.2.3 Effect of enzyme:

Rennin, an enzyme secreted in the young calves intestine, after adding to milk, brings about the coagulation of milk protein. Due to addition of rennin, casein gel is formed. Coagulation of milk by rennin depends on temperature, pH, salt and heating of milk before enzyme action. The

enzyme bromelin from pineapple also clots the milk.

1.3 PROCESSING OF MILK:

Milk is processed by heating, concentrating, evaporating, drying, etc. It helps to produce milk that has low bacterial count, good flavour with satisfactory keeping quality and adds variety to our meals. In general the milk processing operations are as follows:

1.3.1 Pasteurization:

Pasteurization is a process which consists of heating milk to certain temperature for a definite time to ensure destruction of pathogenic bacteria and enzymes. At present, pasteurization is considered as an essential feature in the manufacturing of processed milk and milk products such as butter, ice cream, cheese, etc. Pasteurization of milk destroys about 99 percent of all bacteria, yeasts and moulds. It also inactivates some of the natural enzymes like lipase and improves the keeping quality of milk.

There are three methods used to pasteurize milk:

1. **Holding Method (Batch type):** Milk is heated to 62.8^{0}C temperature and holding it for 30 minutes.

2. **High Temperature Short Time method (HTST):** Milk is heated to 71.7^{0}C temperature for 15 seconds. This method does not impart cooked flavor.

3. **Ultra High Temperature Method (UHT):** Milk is heated to 137.8^{0}C temperature or more for 1 to 2 seconds. This method does not impart cooked flavor. This helps in storing milk for long period, retaining its palatability and protecting it from getting spoil.

1.3.2 Homogenization:

Homogenization, a the process of breaking down fat globules into tiny particles in milk so that they stay integrated rather than separating as cream. This is achieved by passing warm milk or cream through a small aperture under high pressure and velocity. Milk fat globules are formed to 1 to 20 micron in diameter. It decreases the size of fat globules and increase their number with surface area. Homogenized milk has a creamier thick consistency, bland flavour and whiter appearance.

In the manufacturing of ice-cream, homogenization reduces the chances of separation of fat globules resulting in a smoother texture of the finished product as shown in fig. 1.1.

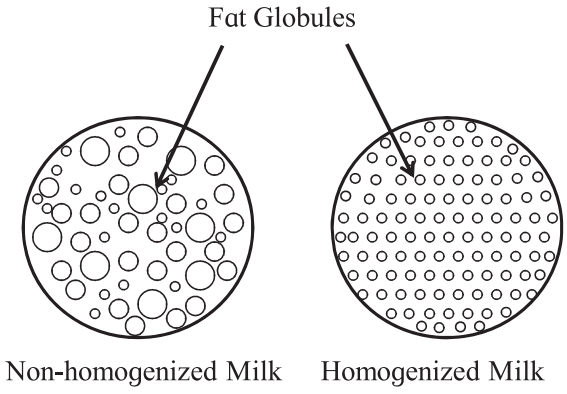


Fig. 1.1 Fat globules in milk

1.3.3 Sterilization:

Milk is heated to a high temperature of 148.8^{0}C and held for 2 to 3 seconds. It assures complete destruction of micro-organisms (bacteria, yeast and mould). The milk is then aseptically packaged, usually in tin cans or tetra packs. Sterile milk is very useful for extended shelf life where refrigeration is not available.

1.3.4 Concentration:

Condensed milk is one which has been concentrated from full cream milk by removal of its water with or without addition of sugar. The removal of water is achieved at a relatively lower temperature by bringing down the boilling point to 55^0C to 63^0C by reducing pressure.

1.3.5 Skim milk (Vacuum concentration process):

Skim milk is a milk from which fat has been removed. Fat content is reduced to 0.5 to 2 percent by centrifugation. Skim milk has lower energy value, higher protein, calcium and riboflavin content as compared to dried whole milk. Taste and flavour is reduced and fat soluble vitamins like vitamin A and D are also reduced. Skim milk is used for low calorie diets and for children who need high protein.

1.3.6 Drying:

Various milk products are made by removing different percentages of water from whole milk e.g. whole milk powder, skimmed milk powder, infant milk powder, butter milk powder, ice cream mix and malted milk powder. Milk powder can be reconstituted in fluid milk.

Drying of milk is done by two methods.

1. **Roller or drum drying:** Milk is sprayed on the surface of the heated metal cylinders in vacuum chamber under low temperature.
2. **Spray drying:** The milk is sprayed into a chamber of hot air by counter current flow. The moisture content of the finished dried dairy product is generally less than 4 percent which prevents the growth of microorganisms.

1.4 MILK PRODUCTS:

Children and adolescents should be encouraged to consume milk products due to their nutritive value. Milk product or dairy product covers a wide range of products which are given below:

1. Fresh milk, skimmed milk, toned milk, condensed milk, flavoured milk, etc.
2. Cream, butter, *khoa*, ghee, *channa*, *paneer*
3. Curd (*Dahi*), yogurt, *lassi*, buttermilk, *chakka*, *shrikhand*, cheese, etc
4. Ice-cream, *kulfi*, softy, etc.

Fig. 1.2 Milk products

5. Dried and condensed milk products: Milk powders (whole milk, skim milk), whiteners, etc.
6. Dairy byproducts- casein, caseinate, whey, whey concentrate, lactose, ghee residue, etc.

1.4.1 Curd (*Dahi*):

It is major product obtained from milk in India. In the preparation of curd, milk is boiled and cooled to 35^0 to 40^0C temperature and then little curd is added as starter culture from an earlier batch. The quantity of starter added depends upon the season of the year and severity of the climate. Various species of *lactobacillus*

and *streptococcus* micro-organism present in the starter curd (culture) multiply and convert lactose of milk to lactic acid which gives sour pleasant taste into the curd. Increased acidity results in casein coagulation. After 6 to 12 hours, depending on the climatic conditions, a smooth, firm, homogenous curd is formed. Curd is used in the preparation of *lassi*, *kadhi*, butter milk and salad dressings etc.

$$\text{Milk (liquid)} \xrightarrow[\text{warm temperature}]{\text{lactic acid bacteria}} \text{curd (gel)}$$

1.4.2 *Chakka:*

Curd is tied up in muslin cloth. All the water is allowed to drain out by hanging it for about 4 to 6 hours. The solid mass that remains in the muslin cloth is known as *chakka*. It is used for making *shrikhand* and allied products by adding sugar and fruit pieces.

1.4.3 Cheese:

Cheese is made by coagulating milk with acid or rennin or both, drawing off the whey and processing the curd into a block. Desirable flavour and texture of cheese is obtained by a process called curing or ripening. It involves holding the curd at specific temperature and humidity for a specified period. Cheese is classified as hard, semi hard and soft cheese. Some important types of cheese are cheddar, swiss, gouda or dutch, cottage, mozzarella, camembert etc. It is used in preparation of sandwich, pizza and pastas.

1.4.4 *Paneer:*

This is obtained by acid coagulation of milk. Milk is coagulated by adding about 1 percent citric acid, lemon juice or vinegar to hot milk. Solid coagulum containing casein is formed and the liquid which separates out is called as whey. *Paneer* is obtained by pressing the coagulum and removing the whey. *Paneer* is also called as Indian cheese. It is used in preparations of variety of dishes such as paneer *paratha*, *paneer pulao*, *palak paneer* and sweets like *rasgulla, rasmalai*, etc.

Do you know ?

The curd bacteria, *lactobacillus* and *streptococcus* are considered as probiotic bacteria which are also known as gut bacteria helping in digestion of human beings.

1.4.5 Butter milk:

It is obtained by adding water to curd and churning it or as byproduct in the process of preparing butter. Buttermilk is used for the preparation of *kadhi* and *lassi*.

1.4.6 *Khoa:*

In India, surplus milk is used for preparation of *khoa*. In the preparation of *khoa*, milk is boiled in a small shallow, round-bottom iron pan stirring continuously in a circular motion with a scraper. During this process, proteins coagulate due to heat and evaporate sufficient moisture, on cooling, it solidifies. The yield is about 20 to 25 percent of the weight of the milk used. It is slightly brown in colour, has a sweet taste and pleasant odour. *Khoa* is used in preparation of various types of milk sweets like *pedha, sandesh, gulab jam,* carrot *halwa,* etc.

1.4.7 Cream:

Milk fat separated from milk by centrifugation is called as cream. Cream used for making butter usually contains 25 to 40 percent fat. Cream is also used in baked products, salad dressings, etc.

1.4.8 Butter:

Butter is an important dairy product in India. It is made from milk cream. The fat content of butter is generally 80 percent. The cream is pasteurized at 62.8^{0}C for about 30 minutes which is immediately cooled. Then a culture of desirable microorganisms (*lactobacillus* starter) is added. The cream is then allowed to ripen for several hours for fermentation. The ripened cream is next churned. The fat globules clump together, cream becomes granular and a definite separation of butter and butter milk takes place. The butter milk is drained off from the churner and butter is washed with water.

1.4.9 Milk powder:

It is prepared form either whole milk or skim milk. Milk can be dehydrated to obtain milk powder which contains moisture 3-4%. It can be stored up to six months or more by using appropriate packaging technology.

Table 1.2 Nutritive value of milk products (per 100 g)

Foods	Water (g)	Protein (g)	Fat (g)	Carbohydrates (g)	Energy (Kcal)	Calcium (mg)	Phosphorus (mg)	Beta-carotene (µg)	Riboflavin (mg)
Curd (Cow's milk)	89.1	3.1	4.0	3.0	60	149	93	102	0.16
Butter milk	97.5	0.8	1.1	0.5	15	30	30	-	-
Skimmed milk liquid	92.1	2.5	0.1	4.6	29	120	90	-	-
Paneer (bufflao's milk)	54.1	13.4	23.0	7.9	292	480	277	-	-
Cheese	40.3	24.1	25.1	6.3	348	790	520	273	-
Khoa (buffalo's milk)	30.6	40.6	31.2	20.5	421	650	420	-	-
Khoa (Skimmed buffalo milk)	46.1	22.3	1.6	25.7	206	990	650	-	-
Khoa (Whole cow's milk)	25.2	20.0	25.9	24.9	413	956	613	497	0.41
Skimmed milk powder (Cow's milk)	4.1	38.0	0.1	51.0	357	1370	1000	-	1.64
Whole milk powder (Cow's milk)	3.5	25.8	26.7	38.0	496	950	730	1400	1.36

Source: Nutritive value of Indian Foods, National Institute of Nutrition (ICMR), Hyderabad

Do you know ?

Why camel milk is a healthy dairy alternative?

Camel milk is considered as "White gold of the desert", due to its remarkable nutritional profile. National Research Center on Camel, Bikaner, Rajasthan is promoting camel milk and its value added products.

Points to remember

- Milk and milk products form an essential part of diet. They are excellent source of fat, protein, minerals (calcium, phosphorus) and vitamin (riboflavin).
- Effect of heat, acid and enzymes changes the physical and chemical properties of milk.
- Processing methods like homogenization, pasteurization, sterilization, dehydration help to increase the shelf life of milk.
- Various products like cheese, *paneer, khoa,* cream, *chakka,* curd, etc can be prepared from milk.

Exercise

Q. 1 a. Select the most appropriate option.

i. _____ is the whey protein.

a. Lactalbumin b. Rennin

c. Casein d. Gluten

ii. Sugar present in milk is _____

a. Sucrose b. Lactose

c. Maltose d. Fructose

iii. Keeping quality of milk is increased by _____

a. Pasteurization b. Homogenization

c. Skimming d. Churning

iv. Homogenization process reduces the size of _____ globules in milk.

a. Carbohydrate b. Lactose

c. Fat d. Proteins

v. Lactose of milk is converted in to lactic acid during _____ making process.

a. Curd b. *Khoa*

c. Cream d. Basundi

b. Match the following.

A		B	
i.	UHT	a.	71.7^{0}C
ii.	HTST	b.	62.8^{0}C
iii.	Sterilization	c.	137.8^{0}C
iv.	Holding method	d.	148.8^{0}C
		e.	100^{0}C

c. Do as directed.

i. State whether the following sentences are true or false.

a. Milk is water in oil emulsion.

b. The fat content of butter is generally 50 percent.

c. Camel milk is considered as yellow gold of dessert.

ii. Identify the odd word.

a. Butter b. Ghee

c. Milk Powder d. Meat

iii. Name the main carbohydrate present in milk.

L				O		

d. Unscramble the underlined word.

NACESI is the milk protein.

Q. 2 Short answer questions.

i. Define the following.

a. Homogenization

b. Skimming of milk

c. Pasteurization

ii. Write short notes on the following.

a. Drying

b. Butter

c. Curd

iii. Answer the following

a. Enlist different milk products used in our diet.

b. Enlist various processing methods of milk.

Q. 3 Long answer questions.

i. Discuss in detail composition of milk.

ii. Explain the process of homogenization of milk.

Project:

i. Visit a dairy plant and prepare a report on the following:

a. Tests carried out on milk at processing plant.

b. Different process used on milk.

c. Milk product manufactured in the dairy unit

d. Packaging and storage of milk and milk products

ii. Visit a supermarket, collect information about various types of milk and milk products available and prepare a booklet on that information.

iii. Prepare charts on milk and milk products

2 Meat, Poultry, Egg and Fish

Contents

Man has satisfied his hunger with animal food from the ancient times. Animal sources include many food items such as meat, poultry, fish, eggs, etc. In general animal foods play an important role in the diet of man since they provide a variety of nutrients that are difficult to obtain in adequate quantities from plant source.

2.1 MEAT

The meat may be defined as 'the muscles of warm blooded terrestrial four legged animals, the chief ones being cattle, sheep, pigs and rabbits'. Meat also includes the glands and organs of these animals.

2.1.1 Structure and composition of meat:

- **Structure of meat:** Lean meat is the muscle tissue of animals. This is referred to as flesh. It is made up of the following parts:

i. Muscle tissue:

It is composed of muscle fibres. These are made up of cells which contain protein called actin and myosin. Short and fine muscle fibres come from young animals. Long and thick muscles fibre come from older animals.

ii. Connective tissue:

Bundles of muscle fibres are held together by creamy white connective tissues. These connective tissues are spread throughout the muscles. Connective tissue is made up of collagen and elastin which are fibrous proteins. Connective tissues are prominently found in legs and neck of animals.

iii. Fatty tissues:

Fat is deposited in the fat cells. From these fatty cells, fatty tissues are formed. Fatty tissues are found around various organs like kidney, heart, liver and under the skin.

iv. Bone:

Meat is also composed of bones. Bones are mainly composed of bone tissues. Organ meats do not contain bones.

v. Blood vessels and nerve tissue:

These are distributed within connective tissues and bones.

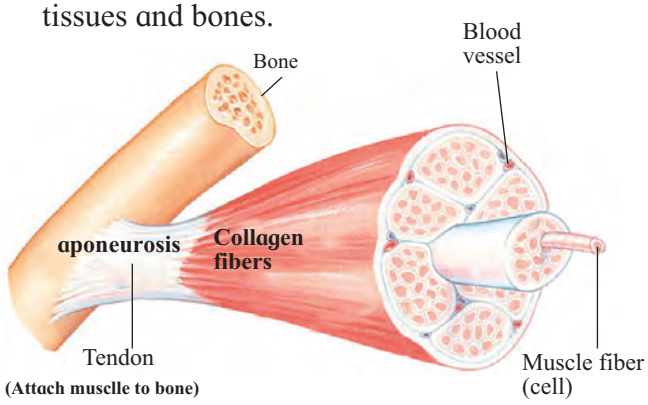


Fig. 2.1 Structure of meat

- **Composition of meat:**

i. Protein: Muscles contain 15 to 20 percent protein. The lean meat contains 20 to 22 percent proteins. Meat proteins contain all essential amino acids that are beneficial to human beings. Actin, myosin, collagen elastin, albumin and globulin are the major proteins that are present in meat.

ii. Fat: The fat content of meat varies from 5 to 40 percent. It varies with the type, breed and age of the animal.

iii. Carbohydrate: These are found only in very small quantities in meat known as glycogen and glucose.

iv. Water: About 70 to 75 percent of meat muscles is composed of water. In young animals, this proportion is higher and in older animals the proportion decreases.

v. Vitamin: Meat has most of the fat soluble vitamins namely vitamin A, D, E and K. Meat is also a good source of B-complex vitamins especially thiamine, riboflavin and niacin.

vi. Minerals: Mostly all minerals vital to human beings are present in meat. It is a good source of phosphorus, iron and copper.

vii. Pigments: Myoglobin and haemoglobin are the two red characteristic colour pigments of meat which are responsible for the meat colour.

2.1.2 Effect of cooking on meat:

Cooking can make meat more tender or less tender than the original raw cut. When meat is cooked, three types of changes take place. They are as follows:

- Melting of meat fat
- Dissolution of collagen in hot liquids to become soft gelatin
- Tissue softening and muscles fibre separation

Due to overheating, muscles fibres contract and meat shrinkage take place. Also it becomes tougher with evaporation of moisture, and tissue become dry and tougher. The overall effect of cooking meat is beneficial from nutrition and digestion point of view.

2.1.3 Methods of cooking meat:

Depending upon the tenderness of meat, various methods of cooking are used. Moist heat method is used for making less tender cuts to more tender, since this provides a means for the conversion of collagen to gelatin. Braising, stewing and pressure cooking are the moist heat methods used for cooking meat, while dry methods include roasting, broiling, pan broiling and frying. Generally, lower cooking temperature for a longer period of time is better than higher temperature for a short period of time. Due to this, increased juiciness, less shrinkage and more uniform colour throughout the cuts is observed.

Changes during cooking:

Cooking destroys the microorganisms that may have contaminated meat and the naturally occurring enzymes also. During cooking denaturation of protein takes place. Colour of the meat changes during cooking. On heating, red meat generally turns brown due to the oxidized pigments in meat. It is considered as the desirable effect.

2.2 POULTRY

The term poultry is applied to all domesticated birds used as food and it includes chicken, duck, geese, turkey and pigeon. Of these, chicken and turkey are the most commonly used for their meat. The poultry birds kept for eggs are called as 'layers' and the meat birds are 'broilers'. The method of re-production of poultry is known as 'hatching' to get the chicks (generally, within 21 days from the fertile egg).

2.2.1 Composition of poultry:

i. **Protein:** Poultry meat has a high protein content varying from 20 to 25 percent.

ii. **Fat:** There is little fat in the meat of young birds, but the fat content is changed by age and species of poultry.

iii. **Vitamins and minerals:** Poultry flesh is a good source of B-complex vitamins and minerals.

iv. **Water:** It contains about 70 percent of water.

2.2.2 Classification of poultry:

Poultry is classified on the basis of age. Age influences tenderness and fat content which decides the cooking methods. The classification according to Indian standards are given as follows,

Table 2.1 Chicken classification according to Indian standards:

Type	Specifications
Broiler/fryer	Chicken aged 8-10 weeks, male or female
Rooster	Chicken aged 3-5 months, male or female
Stag	Male chicken aged 10 months
Fowl/stewing chicken	An adult chicken aged 10 months
Cock	An adult male chicken aged more than 10 months

2.2.3 Cooking of poultry:

Raw chicken has little or no flavour and it develops during cooking. Like meat, moist heat method and dry heat methods are used for cooking. The cooking method is selected on the basis of the tenderness of the poultry and its fat content. Moist heat methods are applied to older and tougher birds while dry heat methods

are applied to young tender birds. To obtain tender, juicy and uniformly cooked poultry, low to moderate heat is to be used. Intense heat results in the toughening of proteins, shrinkages and loss of juiciness. The overall effects of cooking poultry improve the sensory qualities, palatability and digestibility.

2.3 EGG

India is the largest egg producer in the world. The annual egg production has been reported to about 75 billion. From prehistoric times, eggs of many species of birds have been in use as food. But the most commonly preferred for table purpose use are hen's egg. Egg is a major ingredient used in various dishes e.g. cakes, puddings, souffles and other fancy dishes like egg rice, cutlets, etc.

Fig 2.2 Egg

2.3.1 Structure and composition of egg

- **Structure of egg:**

A fully developed egg has a shell, two membranes, albumin or white of the egg, yolk or yellow of the eggs. The approximate weight of hen's egg varies from 40 to 70 g. The whole egg is oval shaped, one side being narrower than the other blunt edge. The different parts of an egg are shown in figure given below.

i. Shell:

The shell is the natural protective outer covering of the internal contents of egg. Shell constitutes about 11 percent of the total weight of an egg. It is made up of insoluble salts of calcium (calcium carbonate) and magnesium. Egg shell is micro porous, brittle and breaks easily. The pores are so small (micro) that they are not visible without magnification. Shells of some eggs are white and brown in colour, it depends on breed of the poultry. In a freshly laid egg, the porous shell is covered with a thin layer of gelatinous mucous coating called the cuticle or bloom. This layer temporarily seals the pores and prevents the loss of odours, flavours and gases from the egg. It also restricts the entry of micro organisms into the egg and thus protects the inner contents from various infections

ii. Lining membrane:

Within the shell there are inner and outer membranes that form the lining membrane. It protects the quality of egg.

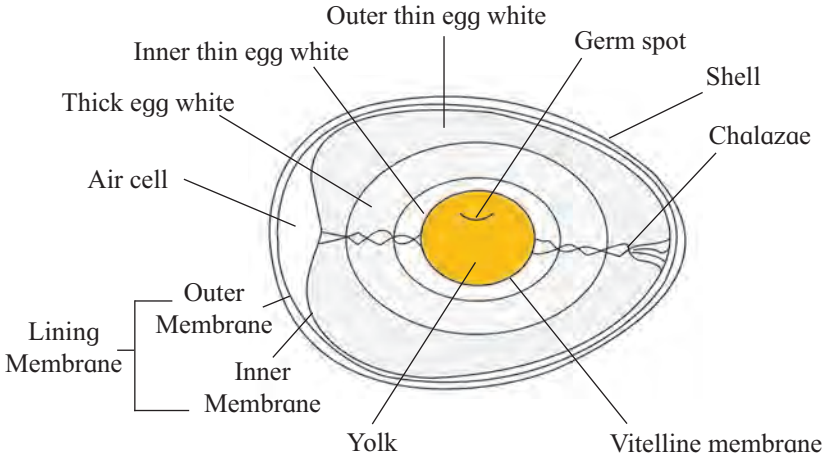


Fig 2.3 Structure of an egg

iii. Egg white:

Egg white lies between the inner lining membrane and the egg yolk. It is composed of three layers.

- Outermost layer of thin egg white
- A layer of thick egg white
- Innermost layer of thin egg white which lies adjacent to the yolk.

In a fresh egg, thin egg white and thick egg white are in equal amounts.

iv. Egg yolk:

It is the central part of an egg. It is usually yellow in colour but the colour varies from dark yellow to orange. The yellow colour of the yolk is due to the colour pigment called xanthophyll. The yolk is enclosed in the yolk sac called the vitelline membrane. This membrane has finger like projections (thread like structure) on either side of the yolk called chalazae which is anchored in the thick egg white. These chalazae help to hold the yolk in the centre. Yolk has a germ spot which develops into a chick under suitable conditions.

- **Composition of egg:**

Egg is an excellent source of important nutrients. Egg yolk and egg white differ in their nutrient content.

i. **Protein:** Egg contains about 12 to 14 percent protein. Egg white contains proteins such as ovalbumin, ovoglobulin and ovomucin. Ovomucin is responsible for the thickness and slipperiness of egg white. Egg yolk contains two lipoproteins namely lipovitellin and lipovitellinin.

ii. **Fat:** Egg contains approximately 10 to 12 percent fat which is in a well emulsified form, therefore it is easier to digest. Egg white has only traces of fat (0.05 percent) whereas egg yolk contains approximately 31 percent fat, hence it is a good source of energy.

iii. **Minerals:** The whole egg contains about 1 percent minerals. Calcium is the most abundant mineral in the whole egg but it is concentrated in the shell. Phosphorus and iron along with calcium are present in yolk. Sulphur is more abundant in the egg white, chiefly as a constituent of the albumin.

iv. **Vitamins:** Egg yolk is an excellent source of Vitamin A, good source of thiamine and riboflavin and a fair source of vitamin D. Egg white is a fair source of riboflavin. Egg does not contain vitamin C.

v. **Water:** Egg contains approximately 74 percent water, but the shelf life is good because the shell protects the inner contents especially fresh egg. Egg white contains a higher percentage of water compared to yolk.

Do you know ?

World egg day is celebrated around the world every year on second Friday in October to raise awareness of the benefits of egg and its importance in human nutrition.

Table 2.3 - Nutritional composition of hens egg (100g)

Part of egg	Weight (g)	Water (%)	Protein (%)	Fat (%)	Mineral (%)
Whole egg	50	74	13	12	1
Egg white	33	88	11	0.05	0.8
Egg yolk	17	50	17	31	1.5

2.3.2 Effect of cooking on egg:

When egg is heated, proteins undergo denaturation and then coagulation. This functional property of coagulation is extremely important in performing some important functions like thickening, binding, coating, foaming, clarifying, etc.

Various egg proteins coagulate at different temperatures. Following factors affect coagulation of egg proteins.

i. **Concentration and part of egg used:** The concentration and the time required for coagulation depends on the proportion of egg in any mixture. Egg white proteins begin to coagulate at about 60^0C. The coagulation of egg yolk begins at 65^0C and is completed at 70^0C. Egg, when diluted with other liquid like milk requires a much higher temperature for coagulation.

ii. **Temperature and time:** The rate of coagulation increases with increasing temperature and time of cooking. A rapidly heated egg mixture coagulates at higher temperature and may curdle than a slowly heated mixture. Therefore, in preparation of soft custard, double boiler helps to give a soft smooth product. The egg white coagulated at higher temperature is firm and tough as compared with the soft and tender product obtained when coagulation takes place at a lower temperature. If eggs are cooked approximately at 85^0C, a soft and tender product will be formed.

iii. **Stirring:** For getting a smooth product stirring is essential as due to stirring, heat is distributed uniformly at the time of cooking and hence a smooth product is formed.

iv. **Effect of other ingredients:** Dilution of egg with milk or water raises the coagulation temperature. Presence of acid or salts speeds up the process of coagulation whereas sugar slows the process.

Foam Formation:

When egg is beaten, it produces foam by incorporating air into it. The foaming of egg plays an important role in many foods because it makes the product light in texture and contributes sponginess due to leavening action. Egg white foams readily to a large volume when beaten. When whole egg or egg yolk is beaten, the volume of foam is lesser in comparison to egg white foam. This is due to the presence of fat which interferes in foam development. When egg yolk alone is beaten, the colour changes to pale yellow due to incorporation of air.

Stages of foam formation in egg white:

1. **Foamy stage:** When eggs are slightly beaten, big bubbles are formed. It resembles soap solution. This foamy stage

is highly unstable. Egg whites are beaten to this stage in food preparations where it is used as thickening, emulsifying, binding, foaming or clarifying agent.

2. **Soft peak stage:** When beating is continued, more air is incorporated into the white. Air bubbles become smaller. When the beater is lifted, the foam forms a soft peak which curls over if the beater is withdrawn. It will also flow when the bowl is tilted.

3. **Stiff peak stage:** On further beating, air cells become very small and even sized. Foam is glossy and holds an upright peak. When the beater is lifted, it will not flow. At this point, the foam reaches its maximum volume and stability. This stage foam is used for puffy omelets, sponge cake and souffles.

4. **Over beaten or dry foam stage:** When the egg whites are over beaten, the foam begins to look dry and the volume of foam decreases. Liquid separates at the bottom of the bowl. At this stage, foam does not perform any function in food preparation.

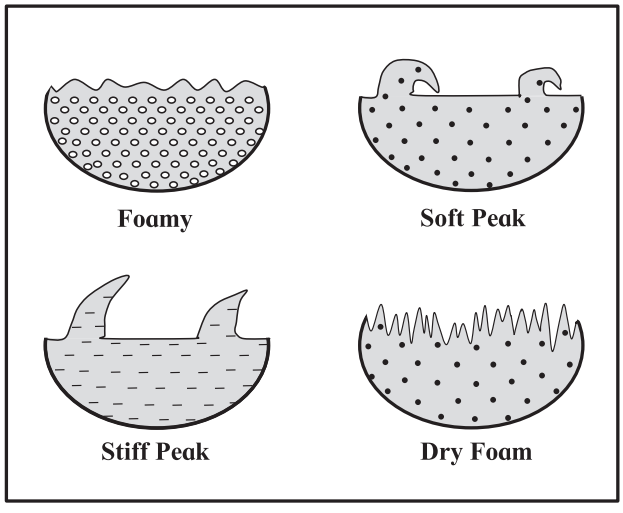


Fig 2.4 Stages of foam formation

2.3.3 Functions of egg in cookery:

Egg is useful in many food preparations. Egg can be used alone or in combination with other foods. The functional properties of eggs are as follows:

1. **Leavening agent (foaming):** One of the most common uses of eggs is as a leavening agent. A leavening agent helps to make a cooked product rise. When eggs are beaten they hold small air bubbles. When heat is applied, the air bubble cells expand resulting in the leavening (spongy) of the product. The egg white foams are important in the development of light structure and good volume of food preparations, especially baked products such as cakes and muffins.

2. **Coating agent:** When a food preparation is dipped in egg and cooked in oil, the surface is sealed by the immediate coagulation of egg protein. This solid thin coating of egg prevents disintegration of the product and further fat penetration. Meat balls, cutlets, banana fritter are few examples where egg acts as coating agent.

3. **Binding agent:** When raw egg is added to any food mixture and cooked, egg protein coagulates and this enables the egg to bind particles or pieces of food together. Hence, egg and other food material bind together, and helps to retain their shape. Minced meat cutlets and *kababs* are some examples where egg acts as a binding agent.

4. **Thickening agent:** As egg protein coagulate due to heat, the product becomes more viscous. This thickening property of egg is used in various products such as custards and cream pie fillings.

5. **Emulsifying agent:** Egg yolk is a good emulsifying agent. An emulsifier helps to hold together the moisture and oil phase in the product Whole egg and egg white are also used as emulsifiers. However, egg yolk is rated as four times as effective an emulsifier compared to egg white. **Lecitho-proteins** that are present in egg yolk are responsible for the emulsifying property of egg yolk. In preparation of mayonnaise and ice cream, eggs are used as emulsifying agents.
6. **Clarifying agent:** In the preparation of clear soup, a small amount of egg is added for clarification. While coagulating, proteins hold suspended particles which can be removed by straining.
7. **Decorating agent:** Egg makes some products more attractive and palatable. For cake decoration, egg is the main ingredient in royal icing. Similarly, egg is used for glazing certain bakery products. It is brushed on the surface of products like biscuits, puffs and buns before baking which imparts shiny and smooth appearance with yellow attractive colour. Slices of boiled egg are used to decorate salad, *biryani*, *pulao* and other products.
8. **Tenderizing agent:** In baked goods, egg helps to retain moisture during baking and storage. Egg binds the other ingredients together and forms a barrier through which moisture cannot escape easily. Hence, eggs contribute to smoothness, moistness, sponginess, and desirable texture (crispy) in baked products.
9. **Flavour and colour:** Egg imparts a desirable flavour and colour to many preparations such as cakes, egg noodle, salads and custards. An eggless cake does not have the same aroma and flavor as other cakes in which egg is added.

2.4 FISH

Fish is a food of excellent nutritional value, providing high quality protein and a wide variety of vitamins and minerals. It is estimated that there are about 25,000 species of fish living today. About 250 different species of fishes are used for edible purposes. Commonly consumed varieties of fish are salmon, sardine, mackerel, tuna, catfish, brown duck, ribbon fish, prawns, pomfret, rohu, trout, tilapia (chilapi), etc.

Fig 2.5 Fish

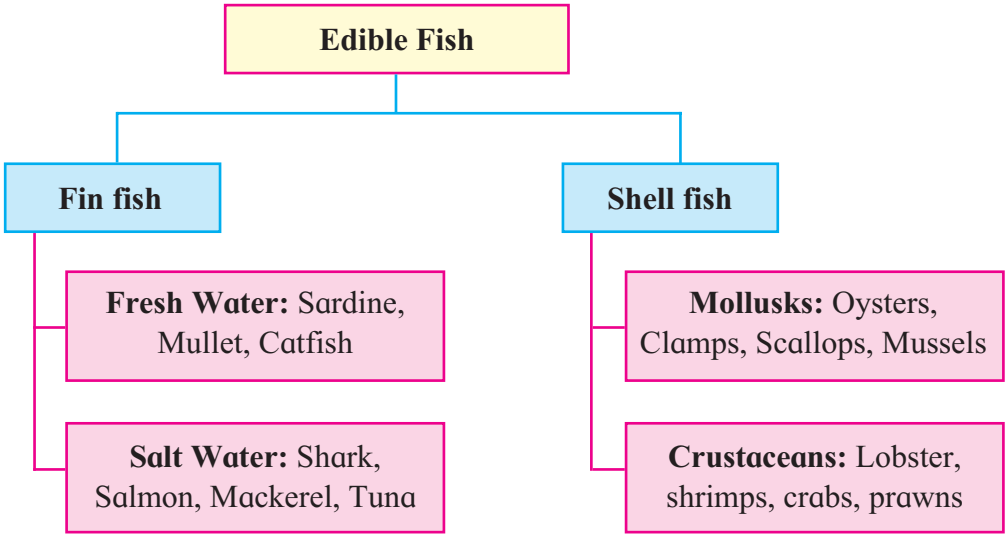
2.4.1 Classification of fish:

Edible fishes are classified into two major categories as fin fish and shell fish based on their anatomical differences. The fin fishes have bony skeleton, whereas, fishes without a skeleton but covered with some type of hard shell are shellfishes. Fin fishes are classified into fresh water and salt water fish. Shell fish is further classified to mollusks and crustaceans. Edible shellfishes are mainly salt water fishes. Fishes are also classified on the basis of fat content.

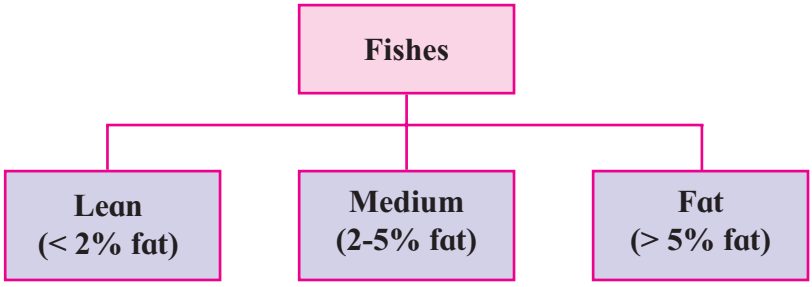
2.4.2 Composition:

The composition of fish varies considerably according to the types of fish. In general, fish is a rich source of protein, fat, minerals and vitamins.

Classification of fish based on anatomical differences



Classification of fish based on fat content



- **Protein:** Fish is an excellent source of protein (about 20 percent):
- **Carbohydrate:** Fish contains some glycogen in muscle tissues and the liver. Fish glycogen is the source of stored energy.
- **Fat:** fish contains less amount of fat, compared to meat and poultry. The fat content of fish varies from 0.1 to 25 percent. The fat content depends on the variety of fish, stage of maturity and the season.
- **Minerals:** Fish is a good source of minerals. It is a good source of copper, sulphur, phosphorus, magnesium and selenium. Salt water fish contains more iron than the fresh water fish. Marine fish is a good source of iodine.
- **Vitamins:** Fish oils are rich source of vitamin A and D. Fish flesh is a fair source of thiamine, riboflavin and a good source of niacin. The vitamin C content of fish is very low.
- **Water:** Water content of most varieties of fish is very high. It ranges from 70 to 80 percent. This is one of the factors responsible for the high perishability of fish.

  Fish is highly perishable. Fish tissue is generally more perishable than animal tissues. Fish has very little connective tissues or has a kind of connective tissue that is very easily hydrolysed. Therefore the structure of fish, especially fin fish, is very delicate and tender even in the raw form.

2.4.3 Fish processing:

The high perishability of fish needs to be handled properly immediately after catching and it is preserved for human consumption. Fish Processing is a way of preserving fish and at the same time improving their shelf life and quality. There are various preservation methods to process fish.

- **Salting** is the process that lowers the moisture content of fish to a point where microorganisms cannot live and grow. Salt partially dehydrates the fish and kills the bacteria (osmotic effect). Salting serves to impart flavour and color to fish and has a profound effect on texture.
- **Smoking** method is an important primary operation used to give the combined effects of preservation, drying and cooking to fish. Different smoking ovens are used. The smoke gives color and flavour to the fish due to its chemical compound.
- **Drying** method is also known as natural dehydration. The most popular fish preservation method is sun drying that is done in combination with salting e.g. salted fish.
- **Curing** method involves chemical preservatives (including vinegar and salt), smoke, and other physical factors to reduce the moisture content of the fish. Cured fish possess a characteristic flavour and texture completely different from those of the fresh fish.
- **Canning** is the packing of fish in an airtight containers such as tin cans and glass jars, which prevent air and microorganisms from entering. Sardines and salmon fishes are the most commonly canned fish sold in the market.
- **Fermentation** is a fish preservation method in which fish is kept in brine solution which undergoes fermentation reaction forming acetic acid and lactic acid i.e. pickeling.

Fig 2.6 Fish processing

2.4.4 Fish products:

- Fish paste
- Fish oils
- Fish sauce
- Fish protein concentrate
- Fish hydrolysate
- Fish meal

2.4.5 Effect of cooking on fish:

Aim of cooking fish is to destroy microorganisms, change the texture and develop desirable flavour. Fish gets cooked very easily and quickly compared to meat and poultry as it contains very less connective tissue. Fish is generally cooked by dry heat, such as baking, steaming, roasting and frying. Fish low in fat is generally fried with fat. Some fish are rich in fat and such fish require very little additional fat in cooking. Frying is one of the most popular methods of cooking fish. Frying gives brown colour, crisp texture and taste to fish.

Moist heat methods are usually not used to make the fish tender but mainly for variety e.g. fish curry. Special care has to be taken while using moist heat method as excessive cooking will disintegrate the pieces and make it less palatable.

Points to remember

Meat:

- Meat is animal flesh that is used as food. Meat of animal like goat, pig, buffalo, deer and rabbit is consumed worldwide.
- Lean meat is composed of muscle tissue, connective tissue, fatty tissues, blood vessels, nerve tissues and bones.
- Meat is cooked by dry heat and moist heat methods of cooking.
- Cooking meat increases its shelf life. There is also a change in colour, tenderness, flavour, juiciness and nutritive value.

Poultry:

- Poultry is the term applied to all domesticated birds.
- Poultry meat is rich in protein, fat, vitamins and water.
- Poultry is cooked by dry heat as well as moist heat methods

Egg:

- Egg consists of an outer protective covering called 'the shell' with an inner lining called the lining membrane.
- Inner edible contents are mainly divided into egg yolk and egg white.
- Egg is a rich source of protein, fat, minerals like calcium, phosphorus and iron, vitamin especially vitamin A, thiamine and riboflavin.
- When egg is beaten or cooked, denaturation followed by coagulation of proteins take place.
- Due to its property of foaming, emulsifying and coagulation, egg performs the functions of leavening, binding, thickening, clarifying and decorating various food products.

Fish:

- Fish is an excellent source of protein, contains low fat in variable amounts, minerals, vitamins and high percentage of water.
- Fish is cooked mainly by dry heat methods as it cooks very fast. Moist heat methods are used mainly for variety of food preparations.

Exercise

Q. 1 a. Select the most appropriate option.

i. Connective tissues is made up of collagen and _____

a. Elastin b. Plastin
c. Albumin d. Gluten

ii. Overheating results in _____ of meat.

a. Softening b. Shrinkage
c. Whitening d. Hardening

iii. _____ from the egg yolk interferes in foam formation.

a. Protein b. Water
c. Fat d. Minerals

iv. Protein content of poultry meat ranges from to _____

a. 05-10 b. 10-15
c. 20-25 d. 30-35

v. The poutry brids kept for eggs are _____

a. Broilers b. Layers
c. Both a and b
b. None of the above

vi. The cogulation of egg yolk begins at _____

a. 95^0 C b. 55^0 C
c. 65^0 C d. 75^0 C

vii. _____ is a fin fish

a. Lobster b. Sardine

c. Crabs d. Prawns

viii. The fish contains < 2% fat are called _____

a. Lean fish b. Fat fish

c. Both a and b

d. None of the above

b. Match the following.

	A		B
1.	Muscles tissue	a.	Chicks
2.	Emulsion	b.	Collagen
3.	Hatching	c.	Mayonnaise
4.	Connective tissue	d.	Crabs
5.	Shell fish	e.	Actin and myosin
		f.	Shark

c. Do as directed.

i. State whether following sentence is true or false.

Egg yolk is an excellent source of vitamin C.

ii. Identify the odd word.

a. Egg white b. Egg yolk

c. Shell d. Fish

iii. Name the colouring pigment found egg yolk.

X				H						L

iv. Unscramble the underlined word.

HLAACEZA helps to hold the yolk in centre of the egg.

Q. 2 Short answer questions.

a. Define the following.

i. Meat

ii. Foaming

iii. Poultry

iv. Emulsification

b. Write short notes on the following.

i. Classification of poultry

ii. Classification of fish

iii. Explain method of cooking fish

c. Answer the following.

i. Different sources of protein in our diet.

ii. Proteins present in muscles fibres.

iii. Effect of cooking fish.

Q. 3 Long answer questions.

i. Discuss the different stages of foam formation.

ii. Write the functions of an egg in cookery.

ii. Describe structure and composition of meat.

iv. Explain in detail about the structure and composition of egg.

v. Give in detail about fish processing

Project:

i. Visit a supermarket. Collect information about various types of meat, fish, and poultry products available and prepare an attractive informative booklet.

ii. Prepare charts on products of an eggs.

Prepare an album of any ten recipe based on meat, egg, fish and poultry.

3 Beverage Technology

Contents

Beverages are integral part of human diet from ancient times. It can be defined as any fluid which is consumed by drinking. The term beverage is derived from French word 'Beivre' which means a drink.

A beverage or drink is a liquid intended for human consumption. Beverages are consumed mainly to quench thirst and compensate loss of body fluids. It consists of diverse group of food products, usually liquids that include the most essential drink, water, to wide range of commercially available fluids like fruit beverage, synthetic drinks, alcoholic beverage, milk, dairy beverages, tea, coffee, chocolate drinks etc.

Fig : 3.1 Beverages

Health Importance of beverages:

Beverages are essential for growth, development, provides health benefits and carrying out various physiological processes that are critical for living a healthy life.

- The water assists in digestion, assimilation and excretion of foods.
- It also helps in removing the toxic substances produced in body as a result of metabolisms such as urea, uric acid, ammonia etc.
- Water in beverages help in regulating the temperature of body through the process of sweating.
- Fruit and vegetable based beverages are source of micro-nutrients and antioxidants.
- Beverages like tea and coffee contain alkaloids which stimulate the central nervous system.
- Fermented dairy beverages are beneficial for improvement of gastro-intestinal health (Neutraceutical properties) due to probiotic bacteria.

3.1 CLASSIFICATION OF BEVERAGES

Beverages are broadly classified into the following groups:

- Non-alcoholic beverages
- Alcoholic beverages
- Soups

According to method of preparation they are of following types:

Non alcoholic beverages	Alcoholic beverages	Soups
• Fruit beverages • Vegetable beverages • Milk based beverages • Malted beverages • Carbonated (non-alcoholic) beverages • Tea and Coffee	• Fermented beverages • Distilled beverages	• Vegetable soup • Chicken or mutton soup

3.2 NON-ALCOHOLIC BEVERAGES

The term non-alcoholic beverages cover drinks that are either totally free from alcohol or that have less than 0.5 percent alcohol by volume. Non-alcoholic beverages includes following beverages:

1. **Fruit beverages:** Fruit beverages are one of the popular categories of beverages that are easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally superior. This group includes beverages made from fruits. The fruit juice or pulp, are mixed with ingredients like sugar, acid, stabilizers, micronutrients and preservative to develop beverages and drinks. Various types of fruit beverages are as shown in the Table 3.1.

Table 3.1: Types of fruit beverages

Fruit beverage	Specifications
Fruit juice	This is natural, unaltered juice of a fruit.
Fruit drink	This is made by liquidifying whole fruit and at least 10% of the volume of undiluted drink must be whole fruit.
Fruit squash	This consists of strained fruit juice (25 %) + citric acid (1%) + preservatives with TSS (40-50° Brix) e.g. orange squash, mango squash etc.
Fruit cordial	It is clarified, sparkling, sweetend friut juice. e.g. lime juice cordial, with 25% juice + 1.5% citric acid + TSS (30° Brix) and preservatives
Fruit punch	A cocktail or combination of various juices (25%) + TSS (65° Brix)
Fruit juice concentrate	Concentrated form of juice from which water has been removed either by heating or freezing
Fruit syrup	Made of any single variety of fruit with 25% juice/ pulp + TSS (65° Brix) + 1.3-1.5% citric acid

Food Safety and Standards Act (FSSAI) has laid down the specifications for various types of fruit juice beverages including nectars are given below (Table 3.2).

Table 3.2 FSSAI specifications for same fruit beverages

Sr. No.	Name of the product	Fruit Juice/ Puree in final product (%) Minimum	Total soluble solids (°Brix) Minimum	Acidity expressed as citric acid, Maximum
1	Squash	25	40	1.0
2	Crush	25	55	1.0
3	Fruit syrups/ sherbets	25	65	1.5
4	Cordial	25	30	1.5
5.	Nectars	20	15	0.3

Flow chart: Preparation of fruit drink (RTS).

Ready to serve (RTS) is a fruit beverage which contain at least 10% fruit juice, 0.3% acid and TSS (10° Brix)

Mature ripe fruits
↓
Washing
↓
Blanching (if required)
↓
Peeling/ cutting/ stone/ peel removal
↓
Pulp/ Juice extraction
↓
Straining
↓
Juice weighing
↓
Preparation of syrup (sugar, water, etc.)
↓
Straining
↓
Mixing with pulp/ juice
↓
Addition of preservatives
↓
Bottling
↓
Capping
↓
Labelling
↓
Storage
↓
Sensory quality evaluation

Fig : 3.2 Fruit juice

2. **Vegetable beverages:** These are usually consumed fresh. They are used separately or as mixtures of various vegetables. Vegetables commonly used for extraction of juices are carrot, tomatoes, cucumber, bitter gourd, etc. They are used for therapeutic as well as culinary reasons. Vegetable juice is often mixed with fruits such as apples or grapes to improve the flavour.

3. **Milk based beverages:** Milk is a wonderful liquid food which imparts benefits to the young and the old alike. This class of beverages are more popular than others because of its high nutritional value. The primary ingredient of these beverages is milk to which many other constituents are added. It can be served hot or cold. Various milk beverages are-

- Milk shakes
- Flavoured milk

- Curd preparations (*Lassi*)
- Custards
- Sweets and desserts

4. **Malted beverages:** This class of beverage comprises of drinks which have malted grains as the main ingredient. The main advantage is that it enhances the nutritional value of beverage.

Do you know ?

A malt drink is a fermented drink, in which the primary ingredient is the grain or seed of the barley plant, which has been allowed to sprout slightly in a traditional way called "malting" before it is processed.

5. **Carbonated beverages:** Carbonated beverages are the one where carbon dioxide gas is dissolved in syrup or water. The presence of carbon dioxide creates bubbles upon release of pressure and fizzing in the beverage. The carbonated beverages are commonly referred as soft drink. Cola or lemonade beverages are typical examples of carbonated beverages. Soda water is another popular type of carbonated beverage which may also be flavoured.

6. **Tea and Coffee:** Tea and coffee is an important category of non alcoholic beverages that is already discussed in standard XI.

3.3 ALCOHOLIC BEVERAGES

Alcoholic beverage is a drink that contains ethanol, a type of alcohol produced by fermentation of grains, fruits, or other sources of sugar using yeast. Alcoholic beverages are classified on the basis of raw material and process technology used in their manufacture.

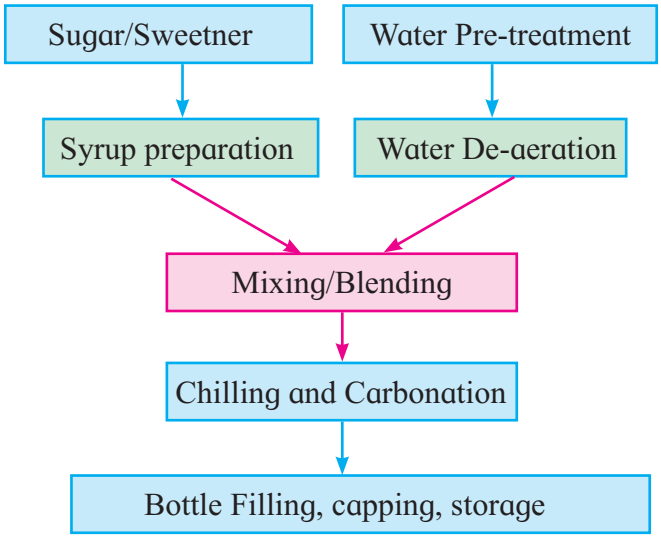
A. Fermentation: It is the process by which yeast converts sugar in grains or fruits into alcohol (ethanol) and carbon dioxide resulting in an alcoholic beverage.

$$\text{Sugar} \xrightarrow{\text{Yeast}} \text{Alcohol} + CO_2$$

The common types of alcoholic fermented beverages are beer and wine.

1. Beer:

Beer is an alcoholic beverage produced by fermentation of grains. Most commonly from malted barley, though wheat, maize (corn), and rice are also used. The starting material for the production of beer is barley malt (barley soaked in water and germinated).



Flow Process Chart of Carbonated Beverages

Do you know ?

Hops are the flowers (seed cones) of hop plants. They are used primarily as a fermenting, flavouring and stabilizing agent in beer.

Beer is produced by extracting raw materials with water, boiling (usually with hops), and fermenting. During fermentation process, starch (sugars) get converted into ethanol and CO_2 gas in the resulting beer. Beer contains about 4-5% alcohol.

2. Wine:

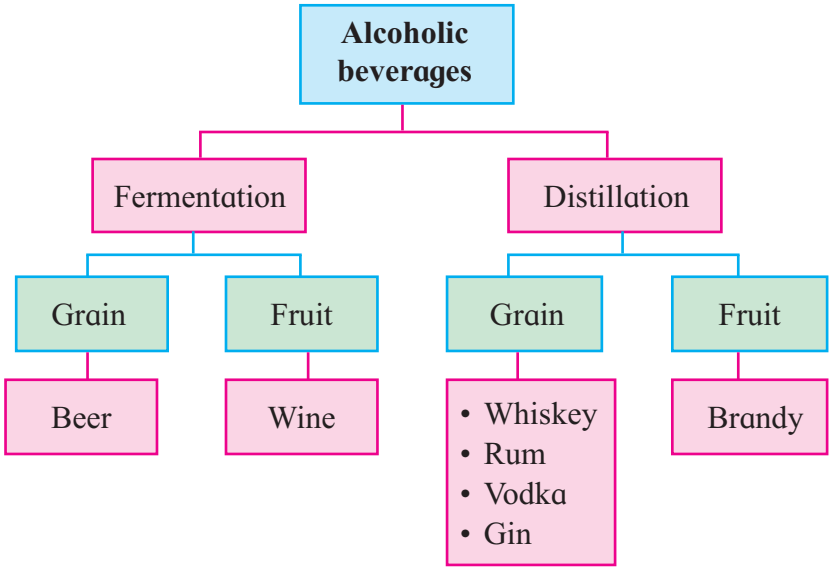
Wine is an alcoholic drink fermented by yeast cells present on grape berry. Yeast consume the sugar in the grapes and converts it to ethanol, carbon dioxide, and heat. Wines are also made from juices of other fruits and berries. Cider is fermented apple juice. Most of the natural wines contain 8-10 % alcohol.

B. Distillation (distilled liquors/spirits):

The distillation of alcoholic fermented beverages is carried out to remove diluting components like water. The liquid obtained by fermentation contains dilute alcohol and concentrated by distillation. Distilled liquors or spirits are made by distilling fermented liquors. Distilled liquors usually have 40% alcohol and they have excellent keeping qualities. Some of the alcoholic beverages belonging to the category of spirit are listed in Table 3.3.

Table 3.3 Alcoholic beverages belonging to category of spirit

Alcoholic beverage	Base material	Alcohol content by volume
Brandy	Fruit Juices mainly grapes	35-60%
Rum	Molasses or sugarcane juice	40-55%
Whisky	Cereal (Barley, corn malt)	40-55%
Vodka	Malted cereals, potatoes etc.	38-40%



Types of Alcoholic beverages

3.4 SOUPS

Soups are important beverages and are generally served as a starters before any meal. They can be vegetarian or non-vegetarian.

Soup is a primarily liquid food generally served warm or hot (but may be cool or cold), that is made by combining ingredients of fruits, vegetables or meat with stock or water.

Fig : 3.3 Soup

Importance of soup:

- Good sources of fluids of fruits and vegetables
- Aids in digestion
- Stimulates appetite by increasing the flow of digestive juices.
- Healthy and nutritious
- Rich in taste
- Rich sources of fibres and minerals

Classifications of soup: Soups are of various kinds like-

1. **Clear soup:** Clear soup is a soup that is made by simmering vegetables and / or meat in a liquid until all flavours are released. These soups are clear and are great for those on a liquid diet.
2. **Thick soup:** They are usually a puree of vegetables thickened with starch. They contain fruits and vegetables pieces, macaroni or noodles, etc.
3. **Cream soup:** They are popular modifications of thick soups with a little amount of cream added to the soups.

3.5 OTHER BEVERAGES

There are other categories of beverages like herbal drinks, energy drinks and sports drinks.

Herbal drinks:

Herbal drinks are prepared by using the infusion of herbs in water. A wide variety of herbs such as aloe vera, ginseng, *shatavari*, *Arjuna*, lemongrass, thyme etc. may be used for as base material for herbal drinks.

Fig : 3.4 Herbal drinks

Energy Drinks:

An energy drinks is a type of drink containing stimulating compounds usually caffeine, which is marketed as providing mental and physical stimulation (marketed as "energy", but distinct from food energy). They may or may not be carbonated and may also contains sugar, other sweeteners, herbal extracts, taurine and amino acids.

Sports drink:

These are also called as electrolyte drinks which are basically designed to replenish the loss of fluid and electrolytes and provide quick energy during the exercise and sports activity. There are three types of the sports drinks which contain various levels of fluid, electrolytes, and carbohydrate.

- Isotonic drinks have 6-8% carbohydrate.
- Hypotonic drinks have a low level of carbohydrates.
- Hypertonic drinks have high levels of carbohydrates.

3.6 COMMON EQUIPMENTS USED IN BEVERAGE PREPARATION

A complete juice processing line is composed of fruit sorter, washer, blancher, crusher/ pulping machine, juice extractor, concentrator, sterilizer/ pasteurizer, filler, bottling, etc. As for different fruits, the production processes are varied.

Fruit sorter:

The fruits are gently carried through high precision systems to be weighted. Fresh fruit and vegetables are then examined by graders and sorting systems according to external (colour, skin defects, etc.) and internal quality such as hardness measurement, brix (degrees), ripeness, damage/ bruise of the pulp, etc.

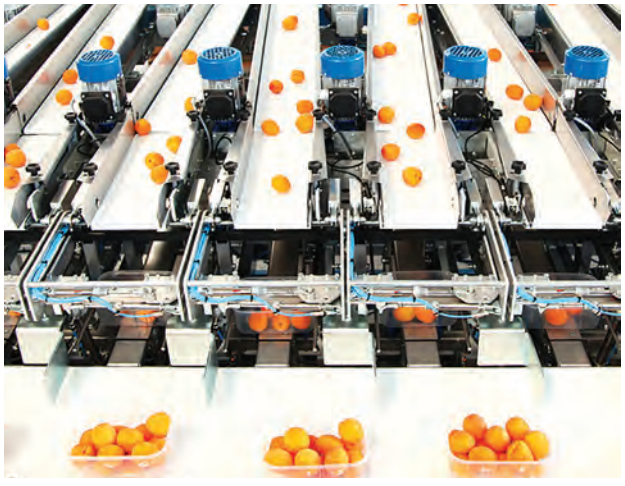


Fig : 3.5 Fruit sorter

Fruit washing:

There are many ways to wash and clean fruits and vegetables before juicing them. Washing fruits or vegetables properly can help to get rid of some of the pesticides, insect residues, and other unnecessary chemicals that can sometimes be found on them.

Fig : 3.6 Fruit washing

Blancher:

Blanching is a process of dipping of fruits and vegetable in boiling water (>88° C) for few seconds/ minutes so as to destroy the enzymes and reduce the microbial load along with residuals, insecticides and pesticides. It also help in softening of tissues, texture and fixing the colouring pigments.

Fruit Pulper:

Fruit pulper is an ideal machine for extracting pulp of fruits like tomatoes, mangoes, raspberry, papaya, pineapple, *jamun*, etc. During the processing, the seeds and skin get separated and discharges through an outlet. The separated pulp is conveyed to the next processing step.

Fig : 3.7 Fruit pulper

Juice extractor:

A juice extractor is a machine that mechanically separates juice from the solid part (pulp) of most fruits, vegetables, leafy greens, and herbs. Most juice extractors are electric operated, which requires less effort than their manual process. The raw material is put into the machine, where juice is separated from pulp and then it is filtered and collected in a container.

Fig : 3.8 Juice extractor

Fruit juice pasteurizer:

Pasteurization is used to kill any contaminating pathogens that might be contained in the raw juice. Here, the product is heated up to pasteurization temperature, maintained at this temperature for the required time, then rapidly cooled down to the temperature for filling, in aseptic conditions. The pasteurization temperature and time will vary according to nature of product.

Fig : 3.9 Pasteurizer

Concentrated/ Steam jacketed kettle:

Steam jacketed kettle are used for concentration of fruit juices by using energy as heating source. Concentrated products are thickened by evaporation of moisture and increasing total soluble solid, thereby shelf life of the product is drastically increased.

Fig : 3.10 Steam jacketed kettle

Deaerator:

Vacuum degasser is also known as vacuum deaerator/vacuum degasifier. It is used to eliminate the air (oxygen) in fruit juice, milk and other drinks. Degassing can inhibit the browning and the oxidation of pigment, vitamins, fragrant component and other substance, so as to preserve the drink quality, and prolong shelf life.

Fig : 3.11 Deareator

Automatic fruit juice filling/packing machine:

Juice filling machine can perform bottle washing, filling and capping processes automatically. It applies to juice, mineral water, and other drinks, including drinks containing gas. It can be used for filling different type of bottles, such as PET bottles, plastic bottles and glass bottles.

Fig : 3.13 Fruit juice filling unit

Points to remember

- Beverages are essential for growth, development and carrying out various physiological processes that are critical for living a healthy life.
- The term non-alcoholic beverages cover drink, that are either totally free from alcohol or that have less than 0.5% alcohol by volume.
- Alcoholic beverages is a drink that contains alcohol
- Soup is a primarily liquid food generally served warm or hot (but may be cool or cold), that is made by combining ingredients of fruits, vegetables or meat with stock or water.

Exercise

Q. 1 a. Select the correct option from given choices.

i. Milk based beverage is an example of _____ .
a. Non alcoholic beverage
b. Alcoholic beverage
c. Soups
d. Carbonated drink

ii. Beverages are called carbonated due to presence of _____ gas.
a. Oxygen c. Carbon dioxide
b. Nitrogen d. Hydrogen

iii. While preparing fruit juice, we should select
a. Unripe fruit
b. Mature and ripe fruit
c. Overripe fruit
d. Decayed fruit

iv. Beer is an example of _____.
a. Fermentation of grain
b. Distillation of fruit
c. Distillation of grain
d. Fermentation of fruit

v. By Distillation process, the alcohol content in the beverage is _____.
a. Concentrated c. Removed
b. Decreased d. Remains same

b. Match the correct pairs.

A		B	
i.	Flavoured milk	1.	Distillation
ii.	Deaeration	2.	Fermentation
iii.	Rum	3.	Fruit pulper
iv.	Beer	4.	Removal of air and gases
v.	Soup	5.	Milk based
		6.	Healthy and nutritious

c. Do as directed.

i. Write true or false.

Fruit juice is natural unaltered drink.

ii. By considering the first correlation complete the second correlation.

Non alcoholic beverage: Fruit beverage

Alcoholic beverage : _____

iii. Identify the odd word.

a. Fruit beverage
b. Vegetable beverage
c. Malted beverage
d. Soup

iv. **Name the word with the help of clue:**

Clue: It is a slight alcoholic drink usually made up of grapes and sometimes other fruits.

	I		

v. **Who am I ?**

....., extracts tomato juice

Clue: I am a machine that mechanically separates juice from the solid part (pulp) of most fruits, vegetables,

Q. 2 Answer the following questions briefly.

i. Define beverage.

ii. Draw the table of classification of beverages.

iii. Give the flowchart of preparation of carbonated beverages.

iv. Explain deaeration.

v. Name the equipments used in preparation of fruit juice.

vi. Give the classification of alcoholic beverages.

vii. List the classification of soup.

Q. 3 Write short notes on.

i. Explain process of preparation of fruit drink.

ii. Explain the distillation process or distilled liquors.

Q. 4 Long questions.

i. Explain any three equipments used in preparation of fruit juice in detail.

ii. Explain beer processing in detail.

Projects:

Select any ten recipes and make an album based on various types of beverages.

Unit-2

Bakery and Confectionery Technology

Objectives

- To understand bakery and confectionery industry.
- To study the role of different types of major and minor ingredients.
- To provide the information about the different types of equipments and tools used for bakery and confectionery products.
- To learn process for manufacturing bakery and confectionery products.

Manufacturing of bakery and confectionery products are considered both as an art and science.

The agriculture processing sector especially food processing industry is gaining importance in trade by contributing in industrial production and employment generation. Among different sectors of food processing industry, bakery and confectionery industry is largely considered as an entry level business by many of the aspirant entrepreneurs.

Bakery and confectionery products have become essential food items for majority of the population. Consumer needs are always changing with respect to novelty in the form of food, aesthetic properties, nutritional value and convenience. These needs are primarily satisfied by bakery and confectionery industry by providing range of quality products in the market like bread, cake, pastries, cookies, crackers, candies, chocolates, etc.

For this a baker or confectioner should have a basic knowledge about how to select and use different ingredients, their roles in particular product, specific characteristics and processing aspects of each product, etc. Hence, this unit is basically designed to acquire the knowledge of bakery and confectionery.

4 Bakery Technology

Contents

Bakery holds an important place in food processing industry and is a traditional activity.

A bakery is a facility that produces and sell flour based baked food items such as bread, cake, pastries, biscuits, cookies, etc. They are also referred as baker's shop or bake shop. The process of making bakery product is called baking.

Fig. 4.1 Bakery products

Fig. 4.2 Traditional baking oven

4.1 WHAT IS BAKERY TECHNOLOGY ?

Technically baking is a science of cooking where flour based food is cooked under prolonged heating condition using dry heat. The equipment used for baking is called as baking oven. The basic ingredients are either formed into a dough or batter and then baked in oven.

Dough:

Dough is a thick, semisolid, malleable and sometimes elastic kneaded ball of flour and water mixture with minor ingredients. The water used is sufficiently enough to hydrate each flour particle.

Batter:

Batter is a semi-liquid mixture of flour and other ingredients with pourable consistency.

4.2 INGREDIENTS IN BAKERY

To make bakery products with outstanding flavour and texture, quality ingredients are needed. Each ingredient in the recipe has a specific purpose and plays an important role in the success or failure of the baked goods.

The selection of the ingredients, their proportions and processing techniques with oven temperature are very important to attain the quality of finished bakery items.

The below image (fig 4.3) shows the ingredients used in bakery.

Fig. 4.3 Ingredients used in bakery

a. Flour: Cereal flours are most commonly used basic ingredient of baked goods. Among various cereals wheat is widely used because of its unique protein i.e. gluten.

The second component of flour which is equally important for giving characteristic quality in product is starch. The hydrated starch gets cooked and forms gel like structure during baking by the process called gelatinization. These gelatinized starches upon cooling gets harden enough to give structure to the product.

Fig. 4.4 Wheat flour

Can you recall ?

In wheat flour gluten occurs in the form of two fractions gliadin and glutenin. When water gets added into flour these two fractions combine and develops a protein network called gluten network.

Gluten network gives elasticity and extensibility to the product and helps in trapping the gas formed by leavening agents.

Types of wheat flour:

Depending upon the protein content, wheat flour is classified into two types.

i. Hard Wheat Flour:

Hard wheat flour contains more that 10% protein and are used for preparation of bread, pies and pizza base where elasticity and sponginess are required.

ii. Soft Wheat Flour:

Soft wheat flour contains less than 10% protein and are used for preparation of cake, pastries, cookies, biscuits, etc.

b. Moistening agents:

Material which provides moistness to the product is known as moistening agent. Water, milk and buttermilk are used as moistening agent. Proper amount of moistening agent is necessary to form dough or batter of desired consistency.

i. Water:

It hydrates the flour and acts as a distribution medium for other small ingredients. It helps in gluten development and gelatinizing the starch. In the case of leavened bread, water acts as an activator, as the yeast will have its optimal growth when it is being supplied with sufficient amount of water. Dry yeast gets activated first by pouring it into luke warm water whereas, chemical leavening agents (carbonates) liberates carbon dioxide gas when in contact with water.

ii. Milk:

Milk helps in improving the nutritional value of bakery product. It tightens flour proteins, which improves the gas retention power of the dough. It improves the flavour, colour and taste of the product. The lactose in milk helps to give crust colour to the product.

iii. Buttermilk:

Buttermilk contains approximately 90% water and 10% milk solids. It also contains lactic acid, which softens the gluten and gives softness to the dough.

c. Shortening:

Fats and oils shorten the process of gluten network formation. Therefore, they are called as shortening agent. Most commonly used shortenings are; hydrogenated vegetable oil, butter and margarine.

Functions:

1. Reduces the stickiness of dough.
2. Increases nutritional value and glossiness of products.
3. To incorporate air during creaming which helps to increase the final volume of products.
4. Acts as heat transfer media.
5. It improves the taste and shelf life of baked products.

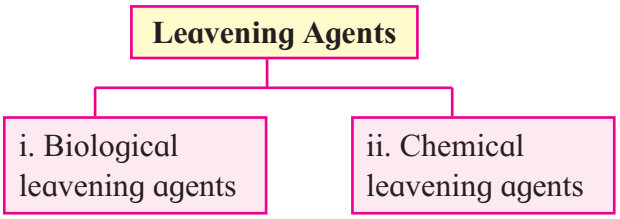
d. Leavening agents:

A leavening agent is also known as a raising agent. It is a substance used in dough and batter that causes CO_2 gas formation that lightens and softens the product.

Functions:

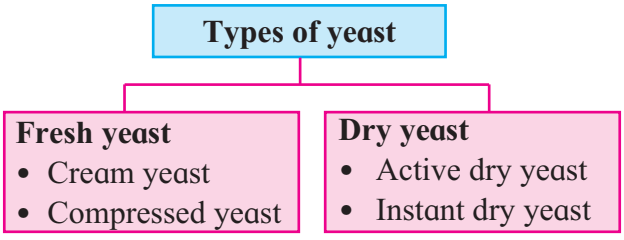
1. Increases the volume of the products.
2. Improves the product by making it tender, softer and lighter.
3. Enhances flavour (taste and smell).
4. Increases the digestibility.

Leavening agents used in bakery products are basically of two types;



i. Biological Leavening Agent:

It is basically single-celled organism (a type of yeast). Baker's yeast (*Saccharomyces cerevisiae*) is the common name for the strains of yeast widely used as a leavening agent in bread and bakery products. It converts the fermentable sugars present in the dough into carbon dioxide and ethanol. The yeast can be divided into two main categories i.e. fresh and dry. Both of these can again be divided into following subcategories:



Fresh yeast:

- Bakers prefer fresh yeast because it is cheaper and more active.
- The cream yeast is available in the suspension form.
- Compressed yeast is generally available in blocks of 500 g.

Dry yeast:

- Dry yeast is preferred in ships and household baking as it can be preserved for a longer time.
- It is generally available in granular form in small packets (10 and 25 g), medium pack (500g) and big pack (10 kg and 25 kg).

ii. Chemical leavening agent:

Most commonly used chemical leavening agent are as follows:

- Ammonium carbonate or bicarbonate.
- Sodium bicarbonate.
- Baking powder.

When using these chemicals following points should be kept in mind.

- The chemicals must comply with provision of the Food and Drugs Act.
- After reaction, the residual substances remaining in the product must be harmless.
- It should not be unpleasant in taste and aroma.
- The chemical should be reasonably cheap and easily available in market.
- They should not react together in dry state.
- They should not readily react together when moistened in the cold state.
- If used in excess quantity, the end product (biscuits/cookies) will spread during baking and it will spoil the appearance.

Ammonium carbonate or bicarbonate:

It decomposes into ammonia gas, carbon dioxide and water. The advantage of this type of leavening agent is that it decomposes in two gases and does not leave a solid residue which make problem in case of sodium bicarbonate. Ammonium bicarbonate is used in biscuit, cookies, crackers and similar products.

Sodium bicarbonate:

Sodium bicarbonate is popularly known as baking soda, which produces CO_2 gas for aeration, when moistened and heated, makes the product more porous. Baking soda is used in cake, cookies and similar products.

Baking powder:

It is a combination of sodium bicarbonate and an edible acid salt (cream of tarter) with or without fillers like starch or flour.

It is available in two forms:

Single acting baking powder: Which acts instantly and the product has to be baked immediately as soon as it is mixed.

Double acting baking powder: In this, some of the gas is released when it is mixed to the batter at room temperature and the final gas is released in the oven during baking.

Do you know ?

Too much baking powder results in a bitter tasting product, while too little results in a tough cake with little volume.

e. Sugar:

Sugar contributes to the flavour and texture of the product. Most commonly table sugar or cane sugar (Sucrose) is used in bakery products. It is also used as a source of energy for yeast during activation. Sugar, being hygroscopic in nature, absorbs and retains the moisture hence the products remain moistened for a longer time thereby it improves the shelf life. Sugar caramelizes when heated, which provides dark brown colour and pleasant flavour to the product.Sugar is used in granulated, grind or fine form (powdered).

Granulated sugar: It is larger in particle size (regular sugar) which is used in homes. It is used in products where it is firstly dissolved in water or milk or where the granular appearance is desirable in mouth feel.

Grind Sugar: This is basically grounded sugar and is used nearly for all purposes like creaming, whisking etc. It is free in grain and has no dust.

Fine Sugar: It is also called icing sugar. It is used for cake decoration and in butter creams, gum pastes, various types of dessert, biscuits, dusting biscuits dough, etc.

f. Eggs and egg products:

Eggs and egg products are the most important raw material for different bakery products. They are used as principal ingredients for the production of cakes, cookies, crackers, biscuits, doughnuts, sweet rolls, icing and meringues, etc. In fact, many of the bakery goods could not be made without eggs.

Functions:

Moistening agent: Moisture present in the egg makes product moist.

Aerating or foaming agent: It incorporates and entraps air properly when whisked, and thereby form stable foams and other aerated structure.

Emulsifying agent: Egg contains lecithin (an emulsifier) which gives homogeneous nature.

Structure building agent: Protein present in the egg when heated gives definite structure.

Enriching agent: Egg contains high quality protein and enriches nutritional value.

Flavouring and colouring agent : Egg possesses a delicious flavour and the yolk gives yellow colour.

g. Miscellaneous ingredients:

The ingredients used in small quantity but which have remarkable effects on the acceptability of the food are called as miscellaneous ingredients.

Salt: Salt (Sodium Chloride) imparts salty taste to the bakery products. Hence product becomes appetizing and palatable. It enhances the natural flavour of the other ingredients. It lowers the caramelization temperature of the cake batter and thereby improves the crust colour.

Flavour additives: They improve the flavour of bakery products and can be divided into two categories:

i. **Natural:** It includes basic ingredients added in the formula like sugar and syrups, fruit pulp/juice, cardamom, nutmeg, cocoa, chocolate, and the essential oils of citrus fruits (lemon and orange) and vanilla, etc.

ii. **Synthetic:** It is the only practical means of flavouring in the bakery industry. Synthetic flavour will have more taste appeal than the natural flavours alone. E.g. vanilla.

Colour additives: The use of colour is as important as the use of flavour. They are used in specialty breads, cakes, and cookies, as well as fillings, icings and coatings. It can be divided into two groups:

i. **Natural colour:** They are obtained from different natural sources i.e. Curcumin from Turmeric (Yellow colour), Chlorophyll from leaves (Green colour), Safranin from Saffron (Orange colour), cocoabeans (Brown colour), etc.

ii. **Artificial colour:** They are dyes. It posses more accuracy, clarity and glossiness than natural colour hence it is widely accepted by all bakers. Some FDA certified synthetic colours are Sunset yellow (Yellow colour) and Brilliant blue (Blue colour), etc.

Fruit and nuts: A variety of dried and preserved fruits and nuts can be used in baked products to produce different types of flavours and colours. Normally raisins, dates, cherry, tutty fruity, pineapple, banana, apple, etc. fruits are used. In addition to fruits, cashew nut, coconut, groundnut, walnut, pistachio nut, almonds, etc. are also used.

Spices: The spices are used comparatively in small quantities in the baked products even though they improve the eating qualities as well as the physical characteristics of the products. Hence they are quite important. A baker can add variety of tastes to the baked products by choosing fresh and high quality spices. E.g. cinnamon, nutmeg and cardamom.

4.3 EQUIPMENTS USED IN BAKERY

Various types of equipments are needed and are used to facilitate the process of baking. Depending upon the use, equipments may be as light or heavy equipments. The light equipments are sometimes called as baking tools.

Always Remember

Baking can be a lot of fun, but without the right equipment, it will only cause a lot of headaches.

a. Weighing balance and measuring utensils:

Weighing balance and measuring tools like measuring cups, measuring spoons, measuring cylinders, pipettes are used to measure dry as well as liquid ingredients.

Weighing balance or generally it is called as weighing scale is a device to measure weight or mass. They are widely used because, they can get calibrated and works with minimum error. Also, a very small quantity of ingredient can be measured with an accuracy of 0.0001g.

Fig. 4.5 Digital weighing balance

Fig. 4.6 Measuring spoons and pan balance

b. Dough and batter mixer:

Mixing is a general term that includes stirring, beating, blending, binding, creaming, whipping and folding. In **mixing**, two or more ingredients are evenly distributed in one another until they become one homogenous product. Each mixing method gives a different texture and character to the baked goods.

Commercially in bakery industry stand mixers are used. Stand mixers are composed of large bowl to contain the material to be mixed and an agitator attached to rotating shaft. The agitators are of different type namely dough hook (bread dough), paddle attachment (batter and icing) and whisk attachment (egg whisking).

Stand mixers are of two type that is spiral mixer and planetary mixer.

In spiral mixer the bowl rotates while the agitator remains steady. It can be used in bread and pizza dough.

In planetary mixer the agitator rotates and bowl remains steady. It can be used for all types of dough, cake batter, whipped cream, fondant icing, etc.

Hook

Paddle

Whisk

Fig. 4.7 Dough mixer and attachments

c. Baking wares:

Baking wares are food preparation containers, used in various techniques of food preparation to contain and shape the finished product while baking. They are also called as pan or mould. A bread pan is also called as loaf pan. Its function is to shape bread while it is proofing (rising) during baking. The most common shape of the bread pan is the loaf. Cake mould varies in their dimensions, and they are called as cake pan, bundt pan, muffin tins, etc. For biscuits, cookies and other bakery products baking trays and moulds are used.

They are made from a conductive material such as metal which might be treated with a non-stick coating. Generally, aluminum is used as a construction medium because of its high heat transfer capacity. In some cases galvanized tins are used for making baking wares.

Bake wares

Bread pan

Cake pan

Bundt pan

Muffin tray and tin

Fig. 4.8 Different types of bake wares used for bakery products

d. Baking oven:

An oven is a thermally insulated chamber used for the heating, baking, or drying of a substance. The air inside the chamber gets heated by use of coil and by the convection mode of heat transfer it gets transferred to the food material (dough or batter).

Ovens are of two types i.e. batch type oven and continuous band oven.

➢ **Batch oven:**

- They are called as retailer oven
- They are used in small as well as large bakeries.
- Commonly used batch type ovens are deck oven and rotary rack ovens.
- In this oven the trays which contain the food material revolves in baking chamber. The baking chamber is an insulated cubic compartment with a door at front.

a. Deck ovens:

Deck ovens transfer heat to the baked goods by the means of conduction in a static baking atmosphere. Conduction heating is a process in which heat travels directly from a hot stone or deck to the loaf of bread or sheet pan being baked.

Fig. 4.9 Deck oven

b. Rotary rack or fixed rack ovens:

They are convection ovens with forced air circulation. They consist of a chamber that can receive one or more racks with 12-18 trays. The rack of tray rotates during baking. Here, baking is by means of hot air circulating in the chamber. The oven is suitable for the baking of different kinds of bread and pastry products, both of small or medium size. These ovens are not recommended for large loaves.

Fig. 4.10 Rotary rack oven

➢ **Continuous band oven:**

- They are known as wholesaler oven.
- Continuous band ovens are used in the industry where production works for 24 hours.

Fig. 4.11 : Continuous band oven

4.4 BAKERY PRODUCTS

Some of the bakery products with their formulations are discussed below.

a. Bread:

Bread is baked dough that may be leavened or unleavened (*roti, bhakri,* etc.). The bread that we get from bakery shop is leavened bread. The bread dough is leavened by natural leavening agent, i.e. yeast. The yeast acts on carbohydrates of wheat flour and produces CO_2 gas. These gas bubbles get retain by gluten network and get evolved during baking. Upon baking, gas bubbles expand and increase the volume of bread. This gives us cooked, light, aerated and porous product called bread.

b. Cake:

Cake is a mixture of flour, eggs, sugar, butter, and liquid that is baked in the oven in a variety of forms and distinguished by a tender texture and sweet flavour. Cake is categorized as sponge cake and butter cake.

Sponge cakes (or foam cakes) are made from whipped eggs, sugar, and flour. They rely primarily on trapped air in a protein matrix (generally of beaten eggs) to provide leavening, with baking powder.

Butter cakes are made from creamed butter, sugar, eggs, and flour. They rely on the combination of butter and sugar beaten for an extended time to incorporate air into the batter.

c. Biscuits and cookies:

The name biscuit comes from the French word bis, which means twice and cuit which means baked. It is a sweet or savoury dry flat cake with a high calorie content. The raw materials used for biscuit manufacture is flour, sweeteners, shortening, milk, leavening agents and other miscellaneous products.

Cookies were at one time referred to as small cakes or sweet biscuits. The Dutch have provided bakers and confectioners with the word kocke which means small cake. There are

more varieties of cookies than any other baked product, because of the possibility of creating so many different shapes, sizes, textures and flavours.

Activity-1

Formulation for bread:

Ingredients	Amount (g)
Wheat flour	100
Wet yeast	2-4
Salt	2
Sugar	6
Fat	2
Water	60 ml

i. Weigh all the ingredients as per the recipe formula.

ii. Sieve flour with salt.

iii. While using dry yeast dissolve yeast in a solution containing sugar, flour and luke warm water to activate it for about 10-15 minutes.

iv. In case of wet yeast add it directly into dough mixer. Knead the dough into soft and pliable dough.

v. Cover the dough with a wet cloth and leave in a warm place for first profing for about 20 minutes (fermentation).

vi. Knock back (knead lightly) the dough and divide the dough into equal pieces, round each piece and pan it.

vii. Allow to rise upto 3/4th height of pan in a proofing chamber.

viii. Bake at 210°-230°C for 10-12 minutes till get golden brown colour.

ix. Remove from oven, cool and de-pan.

Bread Dough

Proofed Dough

Baked bread

Activity-2

Formulation for sponge cake:

Ingredients	Amount (g)
Wheat flour	100
Fat	100
Sugar powder	100
Baking powder	5
Salt	0.85
Whole egg	100 (2 eggs)
Vanila Essence	2-3 ml

i. Sieve refined wheat flour and baking powder for 3 to 4 times for uniform distribution and air incorporation.

ii. Beat egg with vanilla essence using hand beater or using stand mixer with whisk attachment.

iii. Take fat in a bowl, add powdered sugar in it and beat till it become creamy. Add beaten egg and flour mixture and whisk it to get a light and fluffy batter.

iv. Preheat the oven at 170°C.

vi. Pour the batter into greased and dusted pan and tap the pan on table for 2 times to spread batter evenly.

vii. Bake it at 170°C for 25-30 minutes.

viii. Check for baking with knife (stick test).

ix. Remove from oven, cool and de-mould.

Cake batter

Moulding

Baked cake

Activity-3

Formulation for Cookies:

Ingredients	Amount (g)
Flour	180
Butter	100
Sugar	85
Milk	35 ml
Baking Powder	3.5
Salt	1
Vanilla	1 ml

i. Weigh all the ingredients.

ii. Sieve refined wheat flour and baking powder for 3 to 4 times for uniform distribution.

iii. Take butter and cream it, till it becomes soft. Add grind sugar and cream it.

iv. Add essence and flour mixture gradually and knead it to get soft dough.

v. Divide the dough and convert them into small balls or of desired shape.

vi. Preheat the oven at 170°C.

vii. Place the dough pieces on greased and dusted baking tray and inch apart.

viii. Bake it at 170°C for 15-20 minutes till light brown colour.

ix. Remove, cool and pack it.

Biscuits

Cookies

Points to remember

- A bakery is a facility that produces and sell flour based baked food items such as bread, cake, pastries, biscuits, cookies, etc.
- Cereal flours are most commonly used basic ingredient of baked goods.
- Depending upon the protein content, wheat flour is classified into two types, hard wheat flour (> 10% protein) and soft wheat flour (< 10% protein).
- Leavening agents are used for formation of CO_2 gas, they are of two type biological leavening agent and chemical leavening agent.
- For baking of products baking oven is used.
- Bread and biscuit are made from dough whereas cake is made from batter.
- In biscuit high amount of fat is used which retards gluten formation that results in hard and crispy texture.

Exercise

Q. 1 a. Select the correct option from given choices.

i. _____ is a protein present in wheat.

a. Casein b. Gluten

c. Leutin d. Zein

ii. Moistening agent includes_____.

a. Water b. Milk

c. Both a and b

d. None of the above

iii. Yeast is a _____ leavening agent.

a. Biological b. Chemical

c. Mechanical

d. None of the above

iv. Cake is baked at _____ temperature

a. 100°C b. 120°C

c. 170°C d. None of the above

v. Paddle attachment is used for,

a. Bread Dough b. Cake Batter

c. Both a and b d. All of the above

b. Match the correct pair.

	A		B
i.	Soft flour	a.	Sodium bicarbonate
ii.	Lecithin	b.	Fresh Yeast
iii.	Baking soda	c.	> 10% Protein
iv.	Cream yeast	d.	Baking
v.	Oven	e.	Emulsifier
		f.	< 10% Protein

c. Do as directed.

i. Select the odd word

Cake, Biscuit, Bread, Paneer

ii. Complete the word

W			S				G

Clue: Beating egg to incorporate air

iii. Unscramble the word?

leinengva

Clue: I am used for carbon dioxide gas formation

Q. 2 Answer the following questions.

i. What is dough and batter?

ii. Define baking.

Q. 3 Write Short notes on the following.

i. Baking oven

ii. Moistening agent

iii. Shortening

Q. 4. Long answer question.

i. Enlist and explain ingredients used in bakery

iii. Give details about equipment's used in bakery

Project :

Prepare a project report after visiting a bakery unit at your place.

5 Confectionery Technology

Contents

The Indian confectionery market is changing rapidly in terms of trends and consumer behavior pattern. Various multinational companies have entered in the Indian confectionery market by launching new products at affordable prices, wide varieties and addressing the nutritional concern. This has led towards an increased per capita consumption at about 2.3 kg in 2019.

Fig. 5.1 Confectionery products

Fig. 5.2 Confectionery industry

5.1 CONFECTIONERY TECHNOLOGY

Confectionery is related to the food items that are rich in sugar and often referred to as a confection. They contain a large amount of sugar, having a high calorie content, pleasant taste, flavour and easily assimilated by the body. The high nutritive value of confectioneries is due to the considerable carbohydrate, fat, and protein content. Many confections are enriched with vitamins.

5.2 TYPES OF CONFECTIONERY

On the basis of ingredients, methods of production, and final product, confectioneries fall into two main groups:

i. Sugar confectionery:

These are the confectionery products mainly made up of sugar added with flavourings and additives. E.g. candy, chocolate, sweet, toffee, etc.

Fig. 5.3 Sugar confectionery

ii. Flour confectionery:

These are the products in which the base ingredient is grain flour, sweetened with sugar. E.g. cookie, biscuit, cake, pastry, etc. (Chapter 4 deals with flour confectionery.)

In this chapter we will be discussing the different types of sugar confectionery which are as below.

A. Caramels, toffees and fudge:

These are made from sugar with addition of ingredients such as milk-solids and fats (butter and vegetable fats). The characteristic colour and flavour is due to maillard reaction and caramalization.

Can you recall ?

Caramelization is a process of browning of sugar by heating it at desired temperature that results in brown colour and pleasant flavour called caramel.

i. Caramel:

Caramels are derived from a mixture of sucrose, glucose syrup, and milk solids. The mixture does not crystallize, thus remains tacky. Caramels are of three types on the basis of temperature of process such as soft (118 to 120^{0}C), medium (121 to 124^{0}C) and hard (128 to 132^{0}C).

Fig. 5.4 Caramel

Do you know ?

Maillard reaction :

Maillard reaction is a chemical reaction between protein (amino acid) and carbohydrate (sugar), which occurs during heating process that gives rise to brown complex compound on the surface of the product. e.g. bread crust colour.

ii. Toffees:

Toffee is made by heating process of sugar/ jaggery with butter and milk solids. Toffees have lower moisture content than caramels and consequently have a harder texture. The use of fat and milk solid is less than the caramel. The final temperature reaches to about 152^{0}C.

Fig. 5.5 Toffee

iii. Fudge:

Fudge is made by boiling milk, butter and sugar at about 116^{0}C so as to get a soft-ball consistency stage. While cooling the mixture, crystallization of sugar gives a coarse grain to the product. It is also prepared in chocolate flavour by adding 5 to 8 percent of cocoa syrup.

Fig. 5.6 Fudge

B. Hard candy or boiled sweet:

A hard candy, or boiled sweet, is a candy prepared from sugar and liquid glucose boiled to a temperature of about 149-166^{0}C or to the hard-crack stage. After the syrup boiled to this temperature, then it is cooled to form a solid mass containing less than 2 percent moisture. It becomes stiff and brittle as it reaches to room temperature. Within this group a wide variety of products with different colours, flavours and shapes can be get developed. E.g. lollipops, lemon drops, peppermint drops and disks, rock candy, etc.

Fig. 5.7 Hard boiled candy

C. Taffy or chews:

Taffy or chews are a type of candy that is made by stretching and folding a sticky product for many times. The sticky product is prepared

Fig. 5.8 Chews

by boiling sugar, butter or vegetable fat, colour and flavours. The stretching and folding action at 50^{0}C incorporates air bubbles in product and hence it becomes soft, light and opaque.

D. Gelatinized sweets:

This group contains the products from hard gum to soft jellies. They are prepared by combining sugar, glucose syrup and gelling

Fig. 5.9 Gelatinized sweets

Do you know ?

Syneresis: It is a property of leaching out liquid or syrup from gel structure. It is a type of defect in jellies and gums. It occurs during storage period. It is also called as weeping of jelly. This occurs due to excess addition of acid, insufficient pectin, etc.

agents like starch, gelatin or pectin, and heating it at 50 to 80^{0}C. They are distinct from other sweets as their texture is set by gelatinizing agent. E.g. gums, jellies and marshmallows..

E. Fondants and creams:

Fondant is made by boiling a sugar solution with the optional addition of glucose syrup. The mixture is boiled to a temperature in the range of 116-121^{0}C, cooled, and then beaten in order to control the crystallization process and reduce the size of the crystals. Creams are fondants which have been diluted with a weak

Fig. 5.10 Sugar fondant

sugar solution or water. These products are not very stable due to their high water content, and therefore have a shorter shelf-life.

F. Chocolate confectionery:

Chocolate is prepared by roasted and ground cacao seeds which are further converted into powder, liquid paste and block etc. Several types of chocolate based confectionery products are prepared worldwide such as milk, white and dark chocolate etc. It is also used as a

Fig. 5.11 Chocolate

Do you know ?

Chocolate is solid at room temperature yet melts easily within the mouth. This is due to main fat in it, which is called cocoa butter. Chocolates are always stored under refrigerated condition so as to remain firm, stable and avoid its melting.

characteristic flavouring and colouring agents in various food products.

G. Indian confectionery *(Mithai)*:

Fig. 5.12 *Mithai*

Mithai is a generic term for confectionery in India. It is typically made from dairy products and/or some form of flour. Sugar or molasses are used as sweeteners.

Indian confectionary may be broadly classified under four groups.

a. *Khoa* based products such as *burfi*, *pedhas*, *gulab jamun*, *kalakand*, etc.

b. *Channa* based products such as *sandesh*, *rosogolla*, *rasmalai*, *chamcham*, *channa kheer*, etc.

c. Flour, sugar and fat based products such as *sohan halwa*/*papadi*, *mysorepak*, *laddoo*, *boondi*, *jalebi*, etc.

d. Others sweets such as walnut *burfi*/cashew nut *burfi* and other nut candies, *shrikhand*, *shankarpale*, etc.

5.3 INGREDIENTS IN CONFECTIONERY

For every confectionery with a quality characteristic, the ingredients play an important role. The basic ingredients used for confectionery are:

a. Sweeteners: Majority of the confectionery products are sugar based. The following sweeteners are most commonly used in confectionery.

i. Sugar:

Sugar is the main ingredient of confectionery. Most commonly used sugars are cane sugar and beet sugar. The use of beet sugar is limited in Indian industry because of high availability of cane sugar. Depending upon the intended use the sugar is used in various forms, as granulated, fine, icing and in the form of syrup (Liquid).

Granulated sugar

Fine sugar

Icing sugar

Sugar syrup

Fig. 5.13 Forms of sugar used in confectionery

ii. Invert Sugar:

Invert sugar syrup can be prepared by heating sucrose (sugar) and water together by adding edible acid (citric/tartaric/acetic/ lemon juice) or an enzyme (invertase) upto thick consistency.

Fig. 5.14 Invert syrup

Can you recall ?

Invert sugar

Sucrose solution $\xrightarrow[\text{enzyme}]{\text{acid}}$ Glucose + Fructose (Invert sugar)

iii. Corn syrup:

It is purified concentrated aqueous solution which is made from starch of corn. It is also known as glucose syrup to confectioners. It is used to soften texture, add volume and enhance flavour.

Fig. 5.15 Corn syrup

iv. Honey:

Honey is natural invert sugar. It is rich in fructose and is used in developing low calorie confections. It contributes to the sweet taste and delicate flavour.

Fig. 5.16 Honey

v. Other Sweeteners:

These are the compounds which give intense sweetness without adding much bulk to the product. Their sweetness is much more than that of sucrose.

E.g. Sorbitol, mannitol, saccharine, aspartame etc.

b. Milk and milk products:

Milk and milk products are major ingredients in the chocolate and confectionery industry. Milk powder, milk crumb, condensed milk and evaporated milk are the form of milk products being used largely. They provide flavour, bulk, body and structure to the product.

c. Water:

Water is used to dissolve the sugar and other minor ingredients. It acts as a distribution medium for other ingredients.

d. Salt:

Salt is used in small quantity. It enhances the taste and flavour of the other ingredients.

e. Confectionery fat:

Emulsified, hydrogenated shortening is usually used. Shortening should be neutral in taste and flavour. Butter can also be used along with other fats/oil.

f. Stabilizers:

Stabilizers are used to absorb excess moisture. This can avoid crystallization of sugar. Stabilizers may be vegetable, tapioca starch, pectin and wheat or corn starch.

g. Gelling/ thickening agents:

These are the substances that form gels and foams. Some of them are also used as glazing coating. Some of the examples are as follows :

i. **Gelatin:** It is a product obtained by partial hydrolysis of collagen derived from skin, connective tissue and bones of animals. It is available in the form of sheet, flake or powder. It swells when soaked in cold water and gets dissolved on heating. The heated solution upon cooling sets into jelly.

ii. **Pectin:** It is a natural gelatinizing agent present in fruits. It is used for thickening of jam and jellies.

iii. **Gum:** Gums are used as thickening agent and also improves yield of product. They prevent syneresis, splitting and shrinkage during storage of confectionery products. E.g. xanthan gum, guar gum, gum arabica, gum tragacanth, etc.

iv. **Agar-agar:** It is a seaweed and used in the form of dried extruded strips and powder. It forms a well set jelly after boiling in water at 0.2 to 0.5%.

h. Colours and flavours:

Most of the colours and flavours used in confectionery production are synthetic that may be nature identical.

5.4 MANUFACTURING PROCESS

A wide variety of confectionery product can be prepared by using different ingredients, temperature of boiling and method of shaping. In all cases, however, the principle of production remains the same and is outlined below:

i. Balance the recipe
ii. Prepare the ingredients
iii. Mix all ingredients together
iv. Boil the mixture to reach the desired temperature
v. Cool, shape, pack

Many factors affect the production and storage of sweets:

i. The degree of sucrose inversion
ii. The time and temperature of boiling
iii. The residual moisture content in the confectionery
iv. The addition of other ingredients.

Degree of inversion

When a sugar solution is heated a certain percentage of sucrose breaks down to form invert sugar. This invert sugar inhibits sucrose crystallization and increases the overall concentration of sugars in the mixture.

Points to remember

- Confectionery is related to the food items that are rich in sugar.
- The confectionery products falls into two types i.e. sugar confectionery and flour confectionery.
- Caramel is obtained by the process of caramalization.
- The moisture content of hard boiled candy is very less i.e. 2%.
- Cane sugar is most commonly used sugar for confectionery products.
- The degree of inversion and residual moisture content in the product defines the storage quality of confectionery products.

Exercise

Q. 1 a. Select the correct option from given choices.

i. Per capita consumption for confectionery is about ___kg.

a. 2.3 b. 3.3

c. 4.3 d. 5.3

ii. Fudge is made by boiling milk and sugar at about _____ temperature.

a. 116°C b. 216°C

c. 160°C d. 180°C

iii. Lemon drops comes under _____ type of confectionery.

a. Caramel b. Taffy

c. Hard Boiled

d. None of the above

iv. Invert sugar is prepared by _____ process.

a Reversion. b. Inversion

c. Both a and b

d. None of the above

v. _____ is a natural gelling agent present in fruits.

a. Gelatin b. Pectin

c. Protein d. All of the above

b. Match the correct pair.

	A		B
i	Soft caramel	a	Cake
ii	Hard candy	b	Other sweetener
iii	Saccharine	c	Starch of corn
iv	Flour confection	d	118 -120°C
v	Corn syrup	e	149-166°C
		f	Toffee

c. Do as directed.

i. Select the odd word

Gelatin, Pectin, Egg, Agar-agar

ii. Complete the word with the help of clue.

Clue : I am a confectionery product.

	O		D		N	

iii. Unscramble the word?

Clue : I am a sugar confectionary gefdu.

Q. 2 Answer the following questions.

i. What are gelatinized sweets?

ii. Define syneresis.

Q. 3 Write short notes on the following.

i. Sweeteners

ii. Caramel, Toffee and Fudge

iii. Degree of inversion

Q. 4 Long answer question.

i. Explain in detail about ingredients used in confectionery

ii. Give details about manufacturing process of confectionery

Project :

i. Prepare a project on locally available Indian sweet products.

ii. Prepare a project report on imported candies and chocolates.

Unit-3

Community Nutrition

Objectives

- To understand the nutritional status and health condition.
- To study the assessment of nutritional status.
- To get acquainted with different methods of nutritional status assessment.
- To study the modification of existing dietary life style.
- To control various diseases by the diet therapy.

Public health can get improved through correct nutritional status and diet therapy

Nutritional status is an important component of preventive health care. An optimum level of nutrition is the amount of nutrient intake that promotes to the highest level of health. Individual nutritional levels are closely related to the status of health and disease. However, an excess calorie intake leads to obesity, whereas deficit intake of calorie results into a depletion of essential nutrients. Nutritional status is now recognized as one of the prime indicators of the health of an individual.

Normal nutrition is the foundation upon which the therapeutic modifications are based. The primary principle of diet nutrition therapy should be based on the patient's normal nutritional requirements. Any therapeutic diet is only a modification of the normal nutritional needs of an individual to suit what his/her specific condition requires. A person's 'diet' is defined as that person's intake of food and drink (i.e solid and liquid).

6 Assessment of Nutritional Status

Content

Assessment of nutritional status is concerned with malnutrition which is related to protein energy intake through food pattern. Nutritional status is assessed by the types, magnitude and distribution of malnutrition / health disorders. The risk group are identified in different regions according to their nutrition through the food intake. It helps the policy makers, planners, scientists, nutritionists, etc. to plan the project in that region to alleviate the disorders.

6.1 NUTRITIONAL STATUS :

Nutritional status is the current body status of a person or a population group related to their state of nourishment influenced by the intake and utilization of nutrients.

Definition:

The condition of health of a person influenced by the intake and utilization of nutrients is called nutritional status.

Human body receives all the nutrients in appropriate amounts so as to meet the needs of the body, health that is the state of good or optimum nutritional condition. An optimal nutritional status is a powerful factor for health and well being. It is a powerful requirement in promoting health, preventing diseases and improving the quality of life.

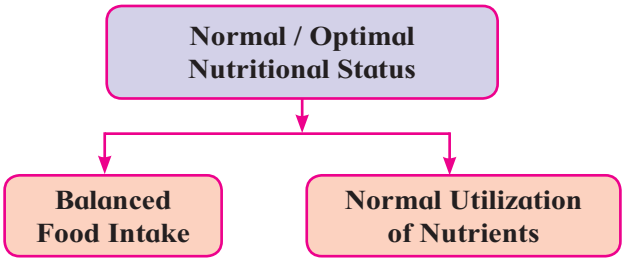


Figure 6.1 : Factors for normal nutritional status

Malnutrition:

When the diet does not provide all nutrients in optimum amount it results into ill health leading to malnutrition.

Malnutrition is defined as impairment of health resulting from deficiency, excess or imbalance of nutrients in the diet. There are two types of malnutrition i.e. under nutrition and over nutrition.

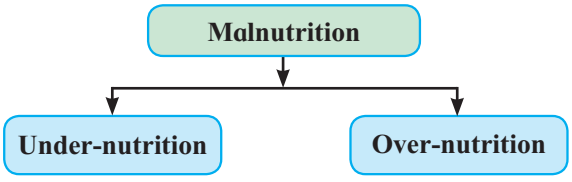


Fig. 6.3: Types of malnutrition

Under-nutrition refers to a deficiency of calories and/or one or more nutrients in the diet. An undernourished person is generally underweight.

Over-nutrition refers to an excess of calories and/or one or more nutrients in the diet. An excessive intake of calories results in overweight which can lead to obesity.

Malnutrition may increase risk of susceptibility to infection and chronic diseases.

- Under nutrition may lead to increased infections and decreased physical and mental development.
- Over nutrition may lead to obesity as well as to metabolic syndrome or type 2 diabetes.

Do you know ?

The world bank estimates that India is one of the highest ranking countries in the world for the number of children suffering from protein energy malnutrition (PEM)

Can you recall ?

- Protein energy malnutrition (PEM)

1. Kwashiorkor
2. Marasmus

- Vitamin deficiency malnutrition

1. Night blindness
2. Beriberi

- Mineral deficiency malnutrition

1. Anaemia, 2. Rickets, 3. Goitre

6.2 NUTRITIONAL STATUS ASSESSMENT

The process of determining the nutritional status of an individual or group is called nutritional status assessment. It is performed to estimate whether an individual or a community is well nourished, under nourished or over nourished.

Definition:

Nutritional assessment is the systematic process of collecting and interpreting information in order to make decisions about the nature and cause of nutrition related health issues that affect an individual and community.

Nutritional status can be assessed for:

- Individual
- Group
- Population (often used in health statistics data comparison with food/nutrient consumption data).

Goals of nutritional status assessment:

The goals of nutritional status assessment are as follow:

1. To identify individuals or population groups who are malnourished.
2. To identify individuals or populations groups at risk of becoming malnourished.
3. To assess the severity and geographical distribution of malnutrition.
4. To identify and analyze the ecological factors that is directly or indirectly responsible.
5. To develop suitable health care programs that meet the community needs which are defined by the assessment.
6. To measure the effectiveness of nutritional programs.
7. To provide factual evidence for the incidence of malnutrition to concerned authorities or policy makers to know the extent of the problem and make the decision on it.

6.3 METHODS OF NUTRITIONAL STATUS ASSESSMENT

The Nutritional status can be assessed by two methods:

I. Direct method:

(a) Anthropometry (b) Biochemical
(c) Clinical (d) Dietary

II. Indirect method:

(a) Ecological variables
(b) Economical factors
(c) Vital health statistics

Do you know ?

- Direct methods deals with the individual and measures objective criteria.
- Indirect methods use community health indices that reflect nutritional influences.

I. Direct method:

(a) Anthropometry method:

The word anthropometry comes from two words: Anthropo means 'human' and metry means 'measurement'.

Anthropometric measurements are a series of quantitative measurements of the muscle, bone, and adipose tissue, used to assess the composition of the body. The core elements of anthropometry are indicated in table 6.1. Anthropometric measurements are used to assess either growth or change in the body composition in specific population groups, including newborn, children under age of five and adults. These measurements are important because they represent diagnostic criteria for under-nutrition and obesity.

The evaluation of nutritional status using anthropometry has been widely employed in field studies and nutritional surveillance programs.

The different measurements taken to assess growth and body composition are presented below:

Table 6.1 Elements of Anthropometry methods

• Height	• Mid-upper arm circumference (MUAC)
• Weight	• Skin fold thickness
• BMI (body mass index)	• Head circumference
• Waist to hip ratio	• Knee height
• Waist circumference	• Sitting height

Advantages:

1. Measures many variables of nutritional significance (like height, weight, skin fold thickness, waist to hip ratio, BMI etc).
2. Readings are numerical and gradable on standard growth charts.
3. Readings are reproducible.
4. Non-expensive and need minimal training.

Limitations:

1. Measurement inaccuracies. (Inter- observers errors in measurement)
2. Limited nutritional diagnosis.
3. Problems with reference in local standards i.e. Local versus International standards.

(b) Biochemical method:

A biochemical assessment method involves analysis of a person's blood, urine, or stool samples. These investigations are extremely helpful in detecting early changes in body metabolism and nutrient supply to the body before the appearance of apparent clinical signs. The results of the biochemical test must be compared with the standards of reference appropriate for age and gender.

Biochemical test provides information about:

- Protein-energy malnutrition
- Vitamin and mineral status
- Fluid and electrolyte balance
- Organ functioning

Nutrients generally examined biochemically are listed below:

Table 6.2 Biochemically examined nutrients

• Proteins	• Niacin
• Vitamin A	• Iron
• Vitamin C	• Folic acid
• Thiamine	• Vitamin B12
• Riboflavin	• Iodine

Advantages:

1. It is useful in detecting early changes in body metabolism and nutrition before the appearance of over clinical signs.
2. It is precise, accurate and reproducible.
3. Useful to validate data obtained from dietary methods e.g. comparing salt intake with 24-hour urinary excretion.

Limitations:

1. Biochemical investigations are expensive and time consuming.
2. They cannot be applied on large scale.
3. Needs trained personnel and facilities.

(c) Clinical method:

This is one of the most practical and important method of determining the nutritional status for individuals and community. It is based on observation on physical signs. It utilizes a number of physical signs that are known to be associated with malnutrition and deficiency of nutrients. It can be applied to a large group of the population

In clinical assessment special attention is given to hair, angles of the mouth, gums, nails, skin, eyes, tongue, muscles, bones, thyroid gland and parathyroid glands. Clinical methods of assessing nutritional status involves checking signs of deficiency at specific places on the body or asking the patient whether they have any symptoms that might suggest nutrient deficiency from the patient. The physical signs recorded must always be defined as precisely as possible. Clinical signs of a specific nutritional deficiency increase the diagnostic significance.

Advantages:

1. Fast and easy method.
2. It is an inexpensive method.
3. Non invasive (Specific equipment or a laboratory is not required).

Limitations:

1. It gives approximate information.
2. It is not effective tool to detect early cases of malnutrition

(d) Dietary method:

A dietary assessment is a comprehensive evaluation of a person's food intake. Assessing food and fluid intake is an essential part of nutrition assessment. It provides information on dietary quantity and quality, changes in appetite, food allergies and intolerance, and reasons for inadequate food intake during or after illness. The results are compared with recommended intake such as recommended dietary allowance (RDA).

Dietary intake of humans is assessed by four different methods. These are:

- 24 hours dietary recall
- Food frequency questionnaire
- Dietary history
- Food diary technique
- Observed food consumption.

i. **24 hours dietary recall:** This method was used to quantify the average dietary intake for a group of people, although it can be used to assess individual nutritional intake. A trained interviewer asks the subject to recall all food and drink taken in the previous 24 hours. It is quick, easy and depends on short-term memory, but may not be truly representative of the person's usual intake. The 24 hour recall method is employed at household level to assess the type of food and the quantities consumed in the last 24 hour.

ii. **Food frequency questionnaire:** A food frequency questionnaire is designed to obtain information on overall dietary quality rather than nutrition composition and intake. The food frequency questionnaire examines

how often someone eats certain foods, and sometimes the size of the portions. In this method the subject is given a list of around 100 items to indicate one's intake (frequency and quantity) per day, per week and per month. The food frequency questionnaire method helps in assessing meal patterns and dietary habits of people by identifying number of times a specific food item is consumed in a defined time-span. This method is quick and inexpensive but under-reporting is common.

iii. **Dietary history:** Dietary history is an interview method composed of two parts. The first part establishes the overall eating patterns and includes a 24 hr recall. Subjects are asked to estimate portion sizes in household measures with aid of standard spoons and cups, food photographs and food models. The second part is known as cross check. This is detailed list of foods that are checked with the subject. The information should be collected by a trained interviewer. Diet history estimates nutrients intake over a long period of time.

iv. **Food diary:** Food intake (types and amounts) should be recorded by the subject at the time of consumption. The length of the collection period range between 1-7 days. Food diary method is reliable but difficult to maintain.

Remember this

Direct methods of nutritional assessment are summarized as ABCD

- Anthropometric methods
- Biochemical methods
- Clinical methods
- Dietary methods

v. **Observed food consumption:** In this method the meal consumed by the subject is weighed and the contents are exactly calculated. This method has high accuracy rate but is expensive and lengthy. This is most unused method in clinical practice but is recommended for research purposes.

II. Indirect method:

(a) Ecological variables: This method examines all components of the food chain and evaluates their effects from four main points of view: human health, environment, society and economy. The components of the food chain are those involved in the process of food production and consumption. The ecological factors related to nutritional status are:

- Food consumption
- Cultural factors like food habits, beliefs
- Food production-food cultivation, storage
- Socio-economic factors - family size, educational status, per capita income
- Health and nutritional services-immunization, feeding programmes

(b) Economical factors: Economic factors play a crucial role and could affect nutritional status and health. Economic factors such as food price and income do influence people's food choices. Moreover, food cost is a barrier for low-income families to have healthier food choices. Economic factors which are considered for assessment of nutritional status are household income, per capita income, population density, food availability and food prices.

(c) Vital health statistics: The term vital statistics signifies the data and analytical methods for describing the vital events occurring in communities. Vital statistics include the counts of births, deaths, illness,

movements and the various statistical techniques like rates and ratios obtained from them and utilized. Morbidity rates for various diseases (such as tuberculosis), maternal and prenatal mortality rates, life expectancy and other health statistics are influenced by malnutrition. They can thus be considered as indirect indicators of the nutritional status of the community.

For public health and nutrition, the vital statistics are most useful. The raw data of vital statistics are generally obtained through the sources of population census, sample surveys and vital statistic registers. Vital health statistics gives an overall picture of the nutritional status of a community and helps the government-making policy decisions.

Points to remember

- The nutritional status of an individual is usually a result of multiple factors that interact with each other at different level.
- Nutritional status can be assessed by
  - Direct methods
  - Indirect methods
- Direct methods of assessment are summarized as ABCD.
- Indirect methods of assessment are ecological variables, economic factors and vital health statistics.
- The use of any one method or a combination of methods is recommended depending on the purpose of the nutritional assessment.
- Nutritional status assessment helps the government in making policies for preventive and corrective measures for the nutritional problems in the community.
- Assessment of nutritional status aids in assessing the prevalence of nutritional disorders, planning corrective measures, and simultaneously evaluating the effectiveness of the implemented strategies.
- The use of any one method or a combination of methods is recommended depending on the purpose of the nutritional assessment

Exercise

Q. 1 a. Select the correct option from the given choices.

i. Malnutrition refers to both over-nutrition and _____

a. Deficiency b. Normal-nutrition

c. Obese d. Under-nutrition

ii. Under-nutrition results due to _____ of one or more nutrients.

a. Deficiency b. Over-nutrition

c. Obese d. Malnutrition

iii. If you eat too much of energy rich foods, you may become _____.

a. Normal b. Over-nutrition

c. Obese d. Under-nutrition

iv. Eating balanced food and having normal utilization of nutrients leads to _____ nutritional status.

a. Deficiency b. Over-nutrition

c. Obese d. Normal

b. Match the correct pairs.

A		B	
i.	Anthropometry	a.	Food frequency questionnaire
ii.	Economical factors	b.	Blood and urine analysis
iii.	Biochemical methods	c.	Morbidity and mortality
iv.	Dietary method	d.	Body Mass Index (BMI)
v.	Vital health statistics	e.	Household income
		f.	Malnutrition

c. Do as directed.

i. Who am I ?

Clue : The meaning of this word is human measurement.

ii. Unscramble the underlined word

Clue : I am deficiency or excess of nutrients

RULAMNNTIOI

iii. Identify the odd one

Height, head circumference, 24 hr diet recall, weight.

iv. Fill in the box with the help of given clue

Clue: This method of assessment is based on observation on physical signs.

C							L

v. By considering the first correlation complete the second correlation

Indirect method-Ecological variables, Direct method ---------- ?

vi. Who am I?

My investigations are helpful in detecting early changes in body metabolism ----------

Q. 2 Answer the following questions briefly.

i. Explain the term nutritional status.

ii. Write the advantages and limitations of anthropometric methods.

iii. Differentiate between clinical method and biochemical methods.

iv. List different methods used to assess the nutritional status.

v. Classify the following under the given headings.

Headings:

1. Direct methods of nutritional assessment
2. Indirect methods of nutritional assessment.

(Biochemical method, ecological variables, clinical methods, anthropometry, vital health statistics, economical factors)

Q. 3 Write short notes on.

i. Goals of nutritional status assessment

ii. Indirect methods of nutritional assessment

iii. Malnutrition

iv. Dietary assessment method.

Q. 4 Long questions.

i. Explain in detail direct methods of nutritional status assessment.

Project :

Assess any five children for their nutritional status and prepare report on it.

7 Diet Therapy

Contents

Diet is the sum of food consumed by a person or other organism. But sometimes such conditions occur which may alter the nutrient requirement of an individual or the person cannot tolerate certain nutrients. In such cases the diet is modified to prevent further complications and hasten recovery. Diet therapy is a broad term for the practical application of nutrition as a preventative or corrective treatment of disease.

Fig 7.1 : Food is medicine

7.1 DIET THERAPY

Diet therapy is the branch of dietetics concerned with the use of foods for therapeutic purpose (treatment of disease). It is a method of eating prescribed by a physician to improve health. It usually involves the modification of an existing dietary lifestyle to promote optimum health.

Definition:

Diet therapy is the branch of dietetics concerned with the modification of normal diet to meet the requirements of the sick individual.

7.2 IMPORTANCE OF DIET THERAPY

1. It helps in maintaining good nutritional status
2. It helps in controlling and managing diseases.
3. Healthy immune system will increase energy levels
4. Treat the deficiency diseases
5. Alter nutrient requirement according to the ability of body to use the nutrient.
6. Give rest to an organ or to the body e.g. intravenous fluids in severe vomiting.
7. Maintaining body weight.
8. Identification of food intolerance
9. Overall improvement in body functions.

7.3 ROLE OF THE DIET IN DISEASES

A well balanced diet is very important for a healthy lifestyle, as it helps to cure many chronic illnesses and diseases. A choice of food makes a huge impact on promoting and maintaining good health. The right diet can help to fight nutritional disorders like diabetes, fever, hypertension, constipation, cancer, obesity etc.

1. Diabetes mellitus:

Diabetes is a disease that occurs when blood glucose (blood sugar) is too high. Carbohydrates is the main source of energy and comes from the food eaten. Diabetes occurs due to the lack of insulin (hormones secreted from the pancreas). If insulin is deficient, glucose is not oxidised in the cell resulting in hyperglycemia.

Hyperglycemia is a chronic disorder caused by carbohydrate metabolites and leads to high blood sugar (diabetes).

Remedial measures:

A diabetes diet simply means eating the healthiest food in moderate amounts and sticking to regular mealtimes.

1. Patient should be educated about the chronic nature of the disease.
2. Diet management and carbohydrate distribution.
3. Regular exercise to lower blood sugar levels.
4. Controlling blood glucose levels by medicines.

Table 7.1 Diet for dibetic patient

Foods recommended	Foods to be avoided
1. Complex carbohydrates rich in dietary fibre e.g. millets, wheat pasta, brown bread. 2. More intake of polyunsaturated fatty acids. 3. Good quality proteins e.g. lean meat, fish, egg, pulses, milk. 4. Higher intake of salads, leafy vegetables, etc.	1. Simple sugars and refined carbohydrates e.g. sugar, jaggery, sweets, 2. Saturated fats and cholesterol containing oils/ fats 3. Alcohol, soft drinks, sweetmeats, nuts and oilseeds

Fig. 7.2 : Food for diabetics

2. Fever and infection:

Fever is defined as an elevation in body temperature above normal temperature of 98.6^{0}F. This increase in temperature may be due to infection caused by microorganisms or body reactions. Fever is a classic sign of infection in the body.

Remedial measures:

During fever, the rate of burning calories increases with the increase in temperature. The body needs more calories to function properly in fever than it requires in an ordinary situation. The overall diet during fever should be light, easy to digest and full of fluids.

1. Educate about personal hygiene and cleanliness
2. If eating out, eat cooked food.
3. Have boiled or treated water
4. Drink lots of water and fluid rich foods.
5. Include good quality proteins (eggs, fish, poultry, soup) in properly cooked form.
6. Avoid heavy meals.

Table 7.2 Diet for fever patient

Foods recommended	Foods to be avoided
1. Foods should be liquid to semi-solid consistency. 2. Cereals in form of custard, *kheer*, boiled rice or *roti.* 3. Good quality, easy to digest proteins like chicken soup, stew, milk based beverage, soft *khichdi, moong dal*, boiled vegetables, (bottle gourd, pumpkin) fruit juices, etc.	1. Solid foods which are hard or tough and require lots of mastication and digestion. 2. Cereals with irritating dietary fibres. 3. Fried, spicy and heavy preparation. 4. Leafy vegetables, raw fruits and vegetables with harsh fibres 5. Pickle, *papad.*

Vitamin B

Fatty acids

Vitamin C

Vitamin E

Fig. 7.3 : A balnced diet in fever and high sweating

3. Hypertension:

It is a condition in which the blood pressure is at above normal level.

Table 7.3 Risk factors for heart diseases

Personal factors	Diet pattern
1. Heredity 2. Smoking 3. Obesity 4. Age groups 30-55 5. Tension and stress 6. Sedentary lifestyle	1. Alcoholic 2. Eating rich foods 3. High in fat and cholesterol 4. Low in fibre 5. High salt intake (sodium chloride) 6. Refined carbohydrate and sugars

Remedial measures:

1. Blood pressure should be controlled
2. Restricting sodium salt consumption
3. Drug therapy
5. Stress management and exercise

Do you know ?

Normal blood pressure is 80/120 mm Hg

Table 7.4 Diet for hypertension patient

Foods recommended	Foods to be avoided
1. Foods low in sodium 2. Cereals e.g. wheat, rice, oat meals, millets 3. All fruits e.g. fresh and canned 4. Vegetables e.g. cabbage, cauliflower, tomato, potato, onion 5. Juices e.g. lime juice 6. Vegetable oil as cooking medium	1. Foods rich in cholesterol and fats 2. Foods rich in sodium 3. Baking powder-cakes, cookies 4. Soda bicarbonate e.g. all cookies 5. *Papad*, pickles

Fig. 7.4 : Foods that lower blood pressure

Fig. 7.5 : High blood pressure herbal remedies

4. Disorder of gastrointestinal tract:

Constipation:

Constipation occurs when a person has difficulty in passing stools or evacuation of hard stools. It is opposite of diarrhoea.

Remedial measures:

1. Mealtimes should be proper and at regular times.
2. Regular toilet habits
3. Proper exercise is necessary
4. More fibre should be included in diet
5. Good intake of fluids

Table 7.5 Diet for constipation

Foods recommended	Foods to be avoided
1. Fluids- at least 1.5 litres water in a day 2. Cereals e.g. wholegrain cereals, millets, oats 3. All fruits e.g. raw and fresh 4. Vegetables e.g. green leafy vegetables, bottle gourd, salads 5. Milk, butter milk, butter and ghee 6. Pulses with husk 7. Vegetable oil as cooking medium	1. Refined cereals 2. Dehusked pulses

5. Cancer:

Cancer is a general term for a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body.

Remedial measures:

1. Cancer patients should stick to a healthy, balanced diet
2. It should include plenty of good quality high protein, healthy fats, fruits, vegetables and whole grains,
3. Have limited sugar, caffeine, salt, processed foods and alcohol.
4. Provide clean nourishing food.
5. Diet should be modified according to the symptoms
6. Increased fluid intake specially coconut water.
7. Food rich in natural antioxidants are advised.

Fig. 7.6 : Foods that fight cancer

6. Obesity:

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health.

Table 7.6 Diet for obesity

Foods recommended	Foods to be avoided
1. Vegetables (a colorful variety-not potatoes) and salads 2. Whole fruits (not fruit juices) 3. Nuts, seeds, beans, and other healthful sources of protein (fish and poultry) 4. Plant oils (olive and other vegetable oils) 5. Plenty of fluids.	1. Alcohol 2. Saturated fats and cholesterol containing oils and fats 3. Refined cereals and sugars

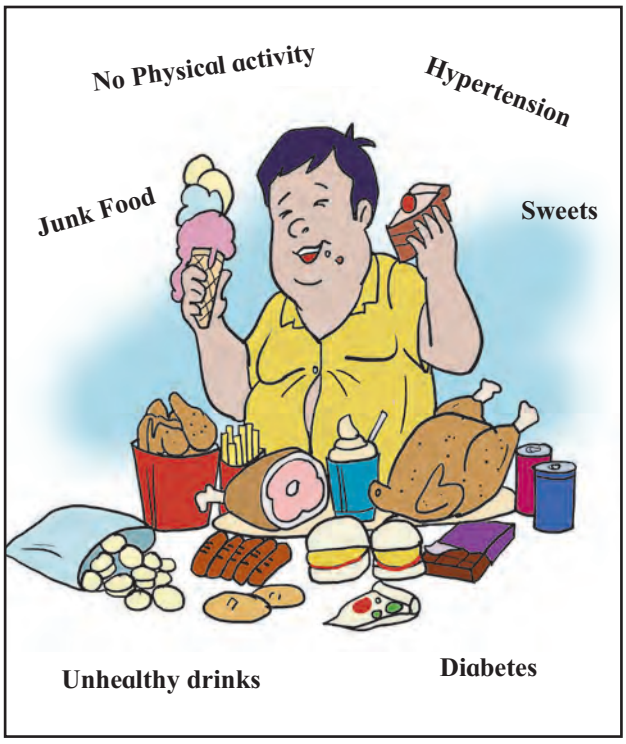


Fig. 7.7 : Reasons of obesity

EAT BREAKFAST EVERYDAY

Breakfast is the most important meal of the day and should never be skipped. It helps you in keeping your calorie intake in control and prevents weight gain.

EXERCISE DAILY

Exercise helps in keeping your body fit and prevent you from becoming overweight by burning the bad calories and releasing the toxins from your body.

EAT MORE FRUITS, VEGETABLES & NUTS

Fruits, vegetables and nuts are a great source of nutrients to help you control your body weight and calorie intake.

GET PLENTY OF CALCIUM

The more calcium in a fat cell, the more fat burns. Apart from dairy food, other sources of calcium are broccoli, oranges etc.

CUT DOWN ON FATTY & SUGARY FOODS

These foods have high amount of calorie and fat which is harmful for our body and leads us towards obesity.

Fig. 7.8 : Five ways to reduce obesity

Points to remember

- Diet therapy is the branch of dietetics concerned with the use of foods for therapeutic purpose (treatment of disease).
- Diet therapy helps in controlling and managing diseases.
- Diabetes is a disease that occurs when blood glucose (blood sugar) is too high. Diabetes occur due to lack of insulin. A diabetes diet simply means eating the healthiest foods in moderate amounts and sticking to regular mealtimes.
- Fever is defined as an elevation in body temperature above normal temperature of 98.6^0F. This increase in temperature may be due to infection caused by microorganisms or body reactions. Fever is a classic sign of infection in the body. Overall diet during fever should be light, easy to digest and full of fluids.
- Hypertension is a condition in which the blood pressure is above normal. A diet low in sodium is preferred and cholesterol containing oils / fats and saturated fats should be avoided.
- Constipation (Disorder of gastrointestinal tract) occurs when a person has difficulty in passing stools or evacuation of hard stools. Diet should include plenty of fluids, fibre and avoid refined cereals and sugars.
- Cancer is a general term for a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. Diet should include plenty of good quality lean protein, healthy fats, fruits, vegetables, whole grains and antioxidants.
- Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health. A well balanced diet rich in fruits, vegetables and fluids is advised .

Exercise

Q.1 a. Select the correct option from the given choices.

i. Which branch of dietetics is concerned with the use of foods for therapeutic purpose (treatment of disease)?

a. Diet therapy b. Food service industry
c. Physiology d. Pharmacy

ii. Diabetes is a disease that occurs when blood glucose, also called blood sugar, is ____.

a. Low c. Remains same
b. High d. Fluctuates

iii. _____ is a classic sign of infection in the body.

a. Fever c. Loss of appetite
b. Vomiting d. Loss of weight

iv. Normal blood pressure is _____ mmHg

a. 40/80 c. 60/100
b. 120/160 d. 80/120

v. _____is a general term for a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body.

a. Fever c. Cancer
b. Hypertension d. Constipation

vi Which food helps in lowering blood pressure?

a. Garlic c. Salt
b. Refined sugars d. Saturated fat

b. Match the correct pairs.

A		B	
i.	Diabetes	a.	Protein and coconut water
ii.	Fever	b.	High salt intake
iii.	Hypertension	c.	Insulin
iv.	Cancer	d.	Need more calories
		e.	Saturated fats

c. Do as directed:

i. Write true or false.
Water intake in constipation should be at least 1.5 litres..

ii. By considering the first correlation complete the second correlation.
Fever: elevation in body temperature above normal
Constipation : _____

iii. Identify the odd one.
a. Fruits b. Green vegetables
c. Plenty of fluids d. Saturated fats

iv. Name the word with the help of clue:
Clue: Diabetes occur due to lack of

		s				

v. Who am I ?
Clue : I am an antiseptic and help in fighting cancer.

Q. 2 Answer the following questions briefly:

i. Define diet therapy.
ii. Give the normal temperatue and blood pressure of body.
iii. What are the risk factors for heart disease ?
iv. Which foods are to be avoided in obesity?

Q. 3 Write short notes on:

i. Which foods are recommended in fever?
ii. Which foods are to be avoided in hypertension?
iii. Explain the remedial measures for a cancer patient.

Q. 4 Long questions

i. Explain the remedial measure and diet for a diabetic patient.
ii. Explain the remedial measure and diet for a cancer patient.

Project:

Select any five diseases and make an album based on its diet therapy.

Unit - 4

Food Safety Management

Objectives

- To know the food adulteration.
- To study some of the common food adulterants present in different food stuffs.
- To understand the food laws and regulations.
- To understand the requirement of FSSAI Act, 2006.
- To identify and classify types of food wastes.
- To know the methods for the food waste disposal.
- To impart knowledge on various acts, rules, regulations, standards, orders and laws related to food articles governing their manufacturing, import, export, storage, distribution and sale.
- To know and understand the various national and international standards for different food articles in detail.
- To understand the food regulation mechanism in our country.

Food adulteration and food waste management can be controlled by Food Laws and Regulations

Food adulteration has become a very common practice in our country and we are consuming these foods almost every day, which have numerous harmful effects to our health. Everyday we hear the news, how the unhygienic and spurious food are entering into our houses. Adulteration of food has many effects on individuals as well as on the community health.

Every nation needs an effective food legislation and food control service to promote a safe, honestly presented food supply, and to protect consumers from contaminated, adulterated, and spoiled foods. Generally the food law is divided into two parts: a basic food act and regulations. The act itself sets out broad principles, while regulations contain detailed provisions.

According to UN estimates, 40 percent of the food produced in India is either lost or wasted. This food wastage however, is not limited to one level alone but perforates through every stage; from harvesting, processing, packaging, and transporting to the end stage of consumption.

The major challenge for many developing countries like India is in the process that the food undergoes before it reaches the end-consumer. Although food wastage is a global problem, India stands a chance to convert this into an opportunity. The world's second most populous country needs to reduce its food wastage to feed the 194 million undernourished Indians who go hungry daily. It is important that technology is adopted at every stage of the supply chain to overcome this problem.

8 Food Adulteration

Contents

A nutritionally balanced diet is essential for maintaining good health. It should be wholesome, hygienic and safe. However, the producers, manufacturers and sellers are adulterating the food to gain maximum profit. It decreases the quality and wholesomeness of food. Consumption of such adulterated food may sometimes endanger the health of the consumer.

8.1 FOOD ADULTERANTS AND FOOD ADULTERATION

Definition: The substance, which lowers or degrades the quality of food material, is called an adulterant.

Food Safety and Standard Act, 2006 has given the definition of food adulteration as follows:

Definition: Food Adulteration refers to the process by which the quality or the nature of a given food is reduced through addition of adulterants or removal of vital substance.

The new concept has been established for food adulteration as unsafe food, which means an article of food which is injurious to health. Basically, during food adulteration, small quantity of non-nutritious low cost substances are added intentionally to food.

Causes of food adulteration:

- To make maximum profit from food items by fewer investments.
- To increase quantity of food production and sales.
- Lack of consciousness of proper food consumption.
- Lack of effective food laws

Types of food adulteration:

1. **Intentional adulteration:** The adulterant substances are added as a deliberate act with intention to increase profit. e.g. sand, marble chips, stones, chalk powder, etc.

2. **Incidental adulteration:** Adulterants are found in food due to negligence, ignorance or lack of proper facilities e.g. Packaging hazards like larvae of insects, droppings, pesticide residues, etc.

3. **Metallic adulteration:** The metallic substances are added intentionally or accidentally e.g. arsenic, pesticides, lead from water, mercury from effluents, tin from cans, etc.

8.2 COMMON FOOD ADULTERANTS AND THEIR IDENTIFICATION

Following are the main food adulterants commonly used in food:

i. **Chalk powder:** Wheat flour, maida and asafoetida are adulterated by chalk powder.

ii. **Washing soda:** Bura sugar may be adulterated with washing soda.

iii. **Starch:** It can be added in milk for thickness and also in turmeric powder to increase the weight.

iv. **Colour:** Metanil yellow colour is used to adulterate bengal gram and red gram dals. Turmeric power is coloured with metanil yellow. Chilli powder is coloured with congo red colour. Tea leaves are adulterated with exhausted tea leaves, which are dried, powdered and artificially coloured. Inedible colours are also added in processing of jelly and jam.

v. **Sawdust:** It is used to adulterate chilli powder, coriander powder or tea powder.

vi. **Chicory:** Coffee is adulterated with chicory powder.

vii. **Iron filings:** Most of the time iron filings are added in semolina (rawa) to increase the weight.

Test for identification:

There are some simple tests for detecting the above adulterants in food. Some of these test can be done at home. These tests are as follows :

Table 8.1 : Tests to detect food adulteration

Name of the food	Adulterants	Tests
Asafoetida (*Hing*)	Soap stone (pumice stone) or other earthy matter.	• Shake a little quantity of powdered sample with water. Soap stone or earthy matter settles at the bottom.
	Chalk powder	• Shake sample with carbon tetrachloride. Asafoetida will settle down. Decant the top layer and add dilute HCl to the residue. Effervescence shows presence of chalk.
Sugar	Washing soda	• Add HCl to a little of sugar (bura) . • Effervescence shows presence of washing soda.
		• When red litmus is put in sugar solution, it turns blue due to washing soda.
Milk	Starch	• Addition of iodine solution to milk give a blue colour if starch is present.
	Addition of water or removal of fat	• Measure the specific gravity with lactometer. • Specific gravity of normal milk is between 1.028 to 1.034. Hence, addition of water to milk tends to decrease the specific gravity of milk.

Turmeric	Starch	• Addition of iodine solution to turmeric solution gives blue (dull green) colour if starch is present.
	Metanil Yellow	• Add few drops of conc. HCl to turmeric solution. Appearance of violet colour indicates presence of metanil yellow.
Chilli powder	Saw dust and red colour	• Sprinkle chilli powder sample on the surface of water. Sawdust floats. Added colour will change the colour of water.
Coffee	Chicory	• Sprinkle coffee powder sample on the surface of water in glass. Coffee floats while chicory sinks leaving a trail of colour.
	Powder of roasted date seeds or tamarind seeds	• Place the sample on the white filter paper and spray 1 % sodium carbonate solution. Dates/ tamarind seeds if present, stain the blotting paper red.
Semolina	Iron filings	• Pass magnet through the semolina (rawa). Iron filings will cling to the magnet.
Tea powder	Iron filings	• Pass magnet through the tea powder. Iron filings will cling to the magnet.
	Exhausted tea leaves, dried and powdered with artificial colour	• Sprinkle the powder on wet white blotting paper. Spots of yellow and red colour appearing on paper indicates that tea is artificially coloured.
Coriander powder	Horse dung powder	• Soak the sample in water. Horse dung will float which can be easily detected.
Cloves	Oil extracted cloves	• Cloves appear shrunken and floats on water.
Pure ghee (Desi ghee)	Vanaspati ghee	• Dissolved one tea spoon of sugar in 10ml of HCl. Add 10 ml of melted ghee and shake thoroughly for 1 minute. Allow it to stand for 10minutes. Pink-red colour indicates presence of vanaspati.
Edible oil	Argemone oil	• Add 5 ml concentrated Nitric acid to 5 ml oil sample. Shake carefully. Allow to separate. Yellow, orange yellow, crimson colour in the lower acid layer indicates adulteration.

Do you know ?

Argemone oil is extracted from argemone seeds. It is mixed with other edible oils to increase their quantity. Consumption of such adultrated oil leads to health disorders.

Detection of water in milk

Detection of detergent in milk

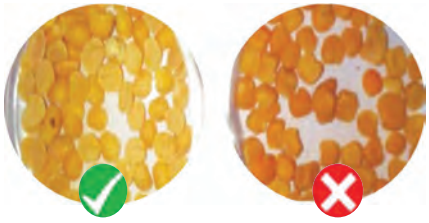
Detection of starch in milk

Detection of chalk powder in sugar

Detection of foreign resin in asafoetida

Detection of soap stone in asafoetida

Detection of synthetic colour in chilli powder



Detection of kesari dal in red gram dal

Detection of added colour in food grains

Detection of papaya seeds in black pepper

Detection of argemone seeds in mustard seeds

Detection of sawdust in powdered spices

Detection of ergot in food grains

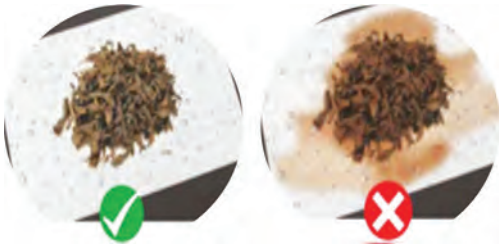
Detection of iron filing in atta/maida/suji

Detection of synthetic colour in turmeric

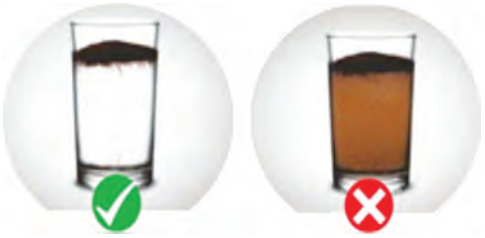
Detection of synthetic colour in green chilli

Detection of clay in coffee

Detection of colour in supari pan masala



Detection of coloured, exhausted tea powder



Detection of chicory powder in coffee

Fig 8.1 : Common food adulteration detection tests observations

Do you know ?

FSSAI has launched 'Detect Adulteration with Rapid Test (DART)' booklet for common quick tests for detection of food adulterants at household by the citizens themselves so as to induce awareness among the consumers about food safety.

Do you know ?

The Ministry of Health and Family Welfare is responsible for ensuring safe food to the consumers. Keeping this in view, a legislation called "Prevention of Food Adulteration Act, 1954" was enacted. The objective was to ensure pure and wholesome food to the consumers and also to prevent adulteration. This act has been repealed ever since the Food Safety and Standards Act, 2006 (FSSA, 2006) has been enforced. FSSA 2006 is now the only compulsory food standard in India.

8.3 EFFECT OF ADULTERATION ON HEALTH

Adulteration of food cause several problems in human beings. Some adulterated food stuff and its harmful effects are as follows.

Table 8.2: Adulterants and their harmful effects

Food Article	Adulterant	Harmful Effects
1. Bengal gram and red gram *dal*	Kesari dal	Lathyrism, Cancer
2. Tea	Coloured, exhausted tea leaves	Liver disorder
3. Coffee powder	Tamarind or date seed powder	Stomach disorder, diarrhoea
	Chicory powder	Giddiness and joint pains
4. Milk	Unhygienic water and starch	Stomach disorder
5. Khoa	Starch and less fat content	Stomach disorder
6. Wheat and other food grains (Bajra)	Ergot (a fungus containing poisonous substance)	Poisonous
7. Sugar	Chalk powder	Stomach disorder
8. Black pepper seeds	Papaya seeds and light berries	Stomach and liver problems
9. Mustard seeds	Argemone seed	Epidemic dropsy and glaucoma
10. Edible oils	Argemone oil	Loss of eyesight, heart diseases, tumour.
	Mineral oil	Damage to liver, cancer
	Castor oil	Stomach problem
11. Asafoetida	Foreign resins, soap stones or other earthy materials	Dysentery
12. Turmeric powder	Yellow aniline dyes	Cancer
	Non permitted colours like metanil yelllow	Highly carcinogenic
13. Chili powder	Brick powder, sawdust	Stomach disorder
	Artificial colour	Cancer
14. Sweets, Juices, Jam	Non permitted coal tar dye (metanil yellow)	Toxic substance Cancer
15. Jaggery	Washing soda, chalk powder	Vomiting, diarrhoea
16. Pulses (green peas and *dal*)	Coal tar dye	Stomach pain, ulcer
17. *Supari* (coloured and scented)	Colour and saccharin	Cancer

8.4 Mitigation measures for addressing food adulteration

- There must be proper surveillance for implementation of food laws.
- There should be monitoring of the activities with periodical records of hazards regarding food adulteration.
- There should be periodical training programmes for Senior Officer/Inspector/Analysts for food safety.
- There should be consumer awareness programmes organized by holding exhibitions/seminars/ training programmes and publishing pamphlets.
- There should be strict actions regarding the legal punishment for those who are involved in food adulteration activities.
- There should be help and support from National and International Organisation/ NGOs for implementation of food laws

Points to remember

- Adulteration makes the food items unsafe and unhygienic for use.
- Food adulteration can lead to slow poisoning and various kind of diseases, which can even result in death.
- Adulterated food is dangerous because it may be toxic and can affect the health and it could deprive nutrients essential for proper development.
- Chalk powder, washing soda, starch, restricted colours, saw dust, and iron filings are some of the common food adulterants.
- There are various tests to detect food adulteration.

Exercise

Q. 1 a. Select the most appropriate options.

i. Article of food which is injurious to health is _____ food.

a. Safe b. Unsafe
c. Nutritious d. Healthy

ii. _____ is added for thickening of milk.

a. Starch b. Oil
c. Protein d. Chicory

iii. Turmeric is adulterated with_____ colour.

a. Golden b. Metanil yellow
c. Saffron d. Congored

b. Match the pairs.

A		B	
i.	Powdered sugar	a.	Papaya seeds
ii.	Coffee	b.	Iron filings
iii.	Kesari dal	c.	Washing soda
iv.	Edible oil	d.	Bengal gram dal
v.	Semolina	e.	Chicory
vi.	Black pepper	f.	Argemone oil
		g.	Saw dust

c. Do as directed.

i. Write true or false.

Bura sugar is adulterated with washing soda.

ii. Select the odd word.

Chalk powder, Sawdust, Iron fillings, Chilli powder.

iii. Who am I :
Clue : I am used to adulterate milk

S			R		

iv. Unscramble the word with the help of clue:

Clue: I am used in adulteration of coffee

O Y R C C H I

Q. 2 Short Answer Questions.

i. Write the test to detect adulteration in the following

1. Pure Ghee
2. Powdered sugar
3. Milk
4. Tea leaves

ii. State the adulterants used to adulterate the following food.

1. Jaggery
2. Asafoetida
3. Edible oil
4. Black pepper seeds
5. Coffee

Q. 3 Long answer questions.

i. Name the common food adulterants and write the tests to detect them.

ii. State the some harmful effects of common food adulterants

Project:

Collect five samples of the following food products from different areas which are sold without packing.

1. Turmeric powder
2. Chilli powder
3. Coriander powder
4. Milk

Perform adulteration test on the samples, evaluate the quality and write a report.

9 Food Laws and Regulations

Contents

All food business operators (FBO's) are aware that quality of their products is important for their survival in today's competitive market. Every nation needs an effective food legislation and food control service to promote a safe, wholesome, hygienic and nutritious food supply and to protect consumers from contaminated, adulterated, and spoiled foods. With the increase in global trade in food products, international organizations for food laws and regulations have become mandatory. The knowledge of food laws and regulation, fortification, additives and labelling are essential for the students. Therefore the objectives of the same are outlined as under;

- To impart knowledge to the students on various acts, rules, regulations, standards, orders and laws related to food articles governing their manufacturing, import, export, storage, distribution and sale.
- To know and understand the various national and international standards for different food articles in detail.
- To understand the food regulation mechanism in our country.
- To become aware of the present scenario related to food fortification, additives and labelling.

Food standards :

Standards are essential to ensure that products and services have desirable characteristics such as quality, safety, etc.

- To protect people from health hazards of consuming unsafe food.
- It is necessary to impose control and check over the quality of food available to the consumer.

In this regard, food standards play a vital role. Violation of these acts is against the law and any person who fails to comply with these acts may have to pay a heavy fine.

9.1 INDIAN STANDARDS

Details of some Indian standards are as follow :

9.1.1 Bureau of Indian Standards (BIS):

The Bureau of Indian Standards (BIS) is the national standards body of India which was established under the Bureau of Indian Standards Act, 1986. To protect consumer's interest, BIS operates a product certification scheme which provides 'ISI mark' for certification of processed food items. ISI certification is compulsory for certain food items such as condensed milk, milk powder, infant milk substitute, infant food, packaged drinking water and mineral water, etc.

Fig 9.1 BIS and AGMARK logo

9.1.2 Agricultural Produce (Grading and Marketing) Act, 1937 (AGMARK):

AGMARK is a certification mark employed on agricultural products in India, assuring that they conform to a set of standards approved by the Directorate of Marketing and Inspection, an agency of the Government of India. It promotes standardization, grading and quality control of agricultural produce.

9.1.3 The Food Safety and Standards Act (FSSA), 2006:

It is a consolidating statute related to food safety and regulation in India. Food Safety and Standards Authority of India (FSSAI) is an autonomous body established under the Ministry of Health & Family Welfare,

fssai
FOOD SAFETY AND STANDARDS AUTHORITY OF INDIA
Inspiring Trust, Assuring Safe & Nutritious Food
Ministry of Health and Family Welfare, Government of India

Fig 9.2 : FSSAI logo

Government of India. FSSAI is responsible for protecting and promoting public health through the regulation and supervision of food safety.

FSSAI was established on 5th August 2011 under Food Safety and Standards Act, 2006 which was operationalized in year 2006. The FSSAI has its headquarters at New Delhi. The authority also has 6 regional offices located in Delhi, Guwahati, Mumbai, Kolkata, Cochin, and Chennai.

The main aims of FSSAI are:

1. Lay down science-based standards for articles of food
2. To regulate manufacture, storage, distribution, import and sale of food
3. To facilitate safety of food

The FSS Act is a bucket for all the older laws, rules and regulations for food safety. The FSS Act took 7 older acts into one umbrella, those are;

1. Prevention of Food Adulteration Act, 1954 and rules, 1955
2. Agriculture Produce (Grading and Marketing) Act, 1937
3. Bureau of Indian Standard (BIS) Act, 1986
4. The standards of weight and measures act, 1976 (Packaged Commodities Rules, 1977)
5. Environment Protection Act, 1986 and Rules, 1989
6. Export (Quality control and Inspection) Act, 1963
7. Essential Commodities Act, 1955
   All Orders under Essential Commodities Act
   a. Fruit Product Order, 1955
   b. Vegetable Oil Products (Regulation) Order, 1998
   c. Solvent Extracted Oil, De-oiled Meal and Edible Flour (Control) Order, 1976.
   d. Meat Product Control Order, 1973
   e. Edible Oil Packaging (Developments and Regulation) Order, 1998
   f. Milk and Milk Products Order, 1992

9.2 INTERNATIONAL STANDARDS

9.2.1 Codex Alimentarius (Codex Standards):

It is a collection of internationally recognized standards, codes of practice, guidelines, and other recommendations relating to foods, food production, and food safety.

CODEX ALIMENTARIUS
International Food Standards
World Health Organization
Food and Agriculture Organization of the United Nations

Fig 9.3 : Codex alimentarius logo

It was established in early November 1961 by the Food and Agriculture Organizations (FAO) of the united nation, was joined by World Health Organisation (WHO) in June 1962.

Codex standards have been formulated to:

1. Protect the health and well being of consumers
2. Ensure fair practices in the food trade
3. Helps to harmonize all the work done by international governmental and non-governmental organizations in preparing food standards.

9.2.2 International Organization for Standardization (ISO) Standards:

It is an international standard. The setting body is composed of representatives from various national standards organizations. Its headquarter is in Geneva, Switzerland. The industry achieves its certification through an audit process done by an independent accreditation agency approved by the International body. There are number of ISO standards as per requirement of the food business operator (FBO).

- ISO 9000 (Quality Management System)
- ISO 14000 (Environmental Management System)
- ISO 22000 (Food Safety Management System)

Fig 9.4 : ISO logo

9.3 INTERNATIONAL ORGANIZATIONS

9.3.1 World Health Organization (WHO):

It is a specialized agency of the United Nations that is concerned with international public health. It was established on 7 April 1948, and its headquarter is in Geneva, Switzerland. The primary role of WHO is to assist its partner members to strengthen programmes for improving food safety in the entire food chain from farm to fork. The goal of WHO is to build a better healthier future for people all over the world.

Fig 9.5 : WHO logo

9.3.2 Food and Agricultural Organization (FAO):

It is an agency of the United Nations founded on 16th October 1945. The day is now celebrated as World Food Day. It leads international efforts to defeat hunger and works to make sure people have regular access to enough high quality food to lead active, healthy lives.

Fig 9.6 : FAO logo

Do you know ?

FIAT PANIS means "Let there be bread"

9.3.3 World Trade Organization (WTO):

It is an inter governmental organization that is concerned with the regulation of international trade between nations. The main function of WTO is to ensure that trade flows smoothly, freely, fairly and predictably as possible and producers, importers, and exporters of food products have no problems. It officially commenced on 1st January 1995 at Geneva, Switzerland. India has been WTO members since its establishment.

Fig 9.7 : WTO logo

9.4 FOOD SAFETY MANAGEMENT SYSTEM

Food safety management system (FSMS) is used in food industry to ensure that the food is safe for human consumption. It includes good manufacturing practices (GMP), good hygienic practices (GHP) and hazard analysis critical control point (HACCP). FSMS identifies, evaluate and control food safety hazards at every stage of food preparation from farm to fork.

9.5 FOOD FORTIFICATION, ADDITIVES AND LABELLING

9.5.1 Food fortification:

Food fortification is the process of adding small quantities of nutrients to a food to improve the nutritional value of the foods. Some times food is fortified with multiple nutrients to simultaneously overcome deficiencies of two or more micro nutrients in a cost effective manner (health care purpose).

Table 9.1 : Some example of food fortification

Sr. No.	Food to be fortified	Nutrients
1.	Salt	Iodine and Iron
2.	Vegetable oil	Vitamin A, D
3.	Milk	Vitamin A, D
4.	Whole wheat flour	Folic acid, iron, vitamin B complex, vitamin E and some minerals etc.

9.5.2 Food Additives:

The uses of food additives is nothing new. Preserving food is an age old necessity by using additives. Food additives are used either to facilitate or complement a wide variety of production methods in the modern food supply. Food additives have two main functions.

1. To make food safer by preserving it from microbial and chemical undesirable changes.
2. To make food nutritious, tasty or feel more pleasing in the mouth.

Definition: Food additives are chemical substances which are not food items by themselves but are intentionally added to food for a functional purpose in the manufacturing, processing, preparation, treatment, packaging, transport or storage of such food to improve the overall quality.

Do you know ?

Food Additives are not new to food industry, some additives have been used by our ancestors e.g. preserving meat by marination of salt, turmeric and spices, preparation of pickles with acid (vinegar/ acetic acid), oil and using sulphur dioxide for wine making.

Food additives should be used only if they perform at least one of the follow functions.

1. Preserve flavour
2. Enhance taste
3. Improve acceptability and appearance
4. Maintain nutritional quality
5. Enhance keeping quality
6. Aid in food processing

Food additives are grouped into different categories on the basis of the functions they perform. The different categories are as follows:

1. Preservatives
2. Antioxidants
3. Emulsifying agent
4. Stabilizers and thickening agents
5. Food colours
6. Flavouring agents
7. Anticaking agents
8. Non nutritive sweeteners

Numbering of additives (E-Number): The “E numbers” in the ingredients list of packaged foods replace the chemical or common name of particular food additives. The “E” stands for “Europe” or “European Union”.

The numbering scheme has been adopted by the Codex Alimentarius Commission to internationally identify all additives, both approved and non-approved. Some examples of additives are as follows

Table 9.2 Food additives with their code numbers

Baking soda	E-500	MSG*	E-621	Paprika	E-160c
Sorbitol	E-420	Polyphosphate	E-451	Glycine	E-640
Thickener and Binder			E-415, E-410, E-412 and E-417		

* MSG : Monosodium glutamate (Ajinomoto)

Table 9.3 Some food additives with their description and examples

S. No.	Additives	Description	Examples
1.	Preservatives	Increases shelf life by preventing or inhibiting microbial spoilage of food	Sodium benzoate, potassium metabisulphite
2.	Antioxidant	Inhibit the effects of oxygen on food and prevent rancidity in food.	BHA, EDTA, TBA, TBHQ
3.	Emulsifying agent	Stabilize emulsion and ensure that water and oils phase held together in an emulsion, e.g. mayonnaise, ice cream and homogenized milk.	Lecithin and Glycerol mono stearate (GMS)
4.	Stabilizers and thickeners	Increases viscosity without substantially modifying its functional properties.	Dextrin and modified starch
5.	Food colour	Added to food to replace the colour lost during preparation, or to make food look more attractive	Curcumin, chlorophyll, caramel, chocolate, lycopene, beetroot red, etc.
6.	Flavouring agent	Gives food a particulars taste, or smell, and may be derived from natural ingredients or prepared artificially.	Synthetic fruits flavours and essential oil
7.	Anticaking agent	Keep dry food powders such as instant idli mix from forming lumps or caking	Calcium phosphate, magnesium carbonate
8.	Non nutritive sweeteners	Added to foods for flavoring to keep the calorie content low or because they have beneficial effects for diabetics.	Stevia, saccharine, aspartame

BHA (Butylated hydroxyl anisole), EDTA (Ethylene di-amine tetra acetic acid),

TBA (Thio Barbituric acid), TBHQ (Tertiary butyl Hydroquinone)

9.5.3 Food labelling and standard:

Labelling inform consumers about what they are purchasing.

FSSAI regulations are a comprehensive set of guidelines that all food product manufacturers and brands should follow. In this, it has been made mandatory for prepackaged and packaged foods to be labelled before they are sold.

The information that should be display on label are tabulated in below table no. 9.4

Fig 9.8 : Image of food product label

Table 9.4 Information to be displayed on the label of food product

Name of food product	Net weight of content
List of ingredients in descending order of weight	Lot/Code/Batch identification number
Symbol of vegetarian / non - vegetarian food	Date of manufacture (dd/mm/yyyy)
Nutritional facts	Use by date/best before date/expiry date
Food additives and their class/ number	Licensing authority and license number
Name and address of manufacturing unit	Picture and graphics of product
Instruction for use and disposal of packaging	Country of origin for imported food

Points to remember

- The Bureau of Indian Standards (BIS) is the national standard body of India which was established under the Bureau of Indian Standards Act, 1986.
- AGMARK is a certification mark employed on agricultural products in India, assuring that they conform to a set of standards approved by the Directorate of Marketing and Inspection, an agency of the Government of India.
- Food Safety and Standards Authority of India (FSSAI) is an autonomous body established under the Ministry of Health & Family Welfare, Government of India. FSSAI is responsible for protecting and promoting public health through the regulation and supervision of food safety.
- FSSAI was established on 5th August 2011 under Food Safety and Standards Act, 2006 which was operationalized in year 2006.
- Codex Alimentarius is a collection of internationally recognized standards, codes of practice, guidelines, and other recommendations relating to foods, food production, and food safety.
- World Health Organization (WHO) is a specialized agency of the United Nations that is concerned with international public health.
- Food and Agricultural Organization (FAO) is an agency of the United Nations founded on 16th October 1945. The day is now celebrated as Word Food Day.
- Food additives are used either to facilitate or complement a wide variety of production methods in the modern food supply.

Exercise

Q. 1 a. Select the correct option from the given choices.

i. Bureau of Indian standards (BIS) is the _____ standard body of India.
a. National b. International
c. Regional d. None of the above

ii. _____ is a certification marks employed on agricultural products in India.
a. AGMARK b. BIS
c. FSSAI d. WHO

iii. _____ is responsible for protecting and promoting public health through the regulation and supervision of food safety.
a. FSSAI b. AGMARK
c. WHO d. ISO

iv. Codex Alimentarius is a _____ recognized standards.
a. National b. International
c. Regional d. State

b. Match the correct pairs

A	B
i. FSSAI Act	a. Environmental Management System
ii. PFA Act	b. 2006
iii. ISO 9000	c. United Nation
iv. WHO	d. Quality Management System
v. ISO 14000	e. Food Safety Management System
vi. ISO 22000	f. 1954
	g. WTO

c. Do as directed:

i. Write true or false.

a. Preservative increases shelf life by preventing or inhibiting microbial spoilage of food

b. Anticaking agents keep dry food powders such as instant idli mix from forming lumps or caking

ii. By considering the first correlation complete the second correlation.
Flavouring agent: Additives that give food a particular taste or smell and may be derived from natural ingredients or created artificially
Anticaking agent : _____

iii. Identify the odd word.
a. BIS b. AGMARK
c. FSSAI d. Preservatives

iv. Name the word with the help of clue:
Clue: E-160c

		p			k	

v. Who am i:
Clue : increase the shelf life by preventing or inhibiting microbial spoilage of food

Q. 2 Answer the following questions briefly:

i. Define food additives with examples.

ii. Discuss the role of food additives in the food processing industry

iii. Define food fortification with examples.

Q. 3 Write short notes on:

i. BIS
ii. FSSAI
iii. WHO
iv. ISO

Q. 4 Long questions

i. What is E numbering and why is it necessary?

ii. Classify the different additives used in the food industry with one example for each of category.

Project:

Select five food laws and make an album based on its rules and regulations.

10 Food Waste Management

Contents

Food waste includes food discarded during production, distribution, preparation and consumption. It comprises materials such as fruits and vegetables trimming, core and rids, left over prepared meals, expired or spoilt ingredients, meat trimming, bone and carcasses, etc.

Food wastage gets generated at all stages of supply chain from raw material harvesting to finished products distribution.

Definition:

Food waste is a food that is wasted or lost uneaten or unused. It is a loss occurred during all the stage like producing, handling, processing, retailing, storage and consumption.

At one end, we say that food is a basic need of human beings, but on the other end it is being wasted. Hence, now-a-days, food waste has been identified as a major challenge of disposal and checking the environmental pollution to be faced in the view of food security.

The agro-based industries generate huge amount of waste material annually around the globe. Most waste in food manufacturing and processing is unavoidable. This huge amount of food ending up as waste is not only a human problem, but also serious economic, nutritional and environmental pollution problems.

Avoiding this quantitative loss and utilization of the waste needs more understanding about its quantity and quality with respect to type, source, nature, etc.

10.1 CLASSIFICATION OF FOOD WASTE

The quantity and quality of food waste depend primarily upon its mode of use and varies with change in source point of waste generation. Unscientific view towards use and processing of food and insufficient infrastructure facility decides the wastage percentage.

Food waste can be classified by following two ways;

I. Classification based on type of industry:

A. Food service industry waste

B. Food processing industry waste

II. Classification based on nature of waste:

A. Dry waste

B. Wet waste

I. Classification based on type of industry:

A. Food service industry waste:

From the food security point of view, importance should be given more on the food waste being generated in food service industry. The food service industry comprises hostel mess, canteen, restaurants and hotels. Also, one should think about the food wastage at home kitchen and it can be considered as service industry waste. Hence, this food waste can be categorized in two sub-types.

i. Home kitchen waste:

Kitchen waste is defined as leftover organic matter at domestic level. This is generated due to

1. Improper management and consumption pattern

2. Improper processing techniques

ii. Catering industry waste:

The waste generated from hotels and restaurants, industrial kitchens, canteens and mess is called as catering industry waste. This is generated due to

1. Over buying
2. Over production
3. Improper management
4. Poor cooking methods

B. Food processing industry waste:

Food processing industry is considered to reduce the wastage of fresh produce by using the technology for the production of value added products The post harvest losses of fresh produce has been reported to the tune of 40-50% from the point of production upto the consumption e.g. harvesting, collecting, grading, packaging, transportstion, storage, distribution and processing.

II. Classification based on nature of waste:

The amount and type of waste generated largely depend upon its nature. It can be classified as dry waste or wet waste. The major difference between these two classes is their moisture content.

The nature i.e. dry or wet decides it's utilization and disposal method. The dry waste is much easy to handle and process it further. But, due to high moisture content in case of wet waste the decomposition changes takes place at a faster rate. Therefore it becomes very difficult to dispose off it immediately.

Segregation of dry and wet food waste generated is the first step in proper waste management. Generally at metro cities, different colored bins for collecting waste materials are given by municipal corporation to each households as dry waste and wet waste bin. Generally for dry waste blue color and for wet waste green color coded bins are used.

Dry waste

Husk, bran, shells, dry fruit peels, seeds, flour, paper, corrugated fiber boxes, plastic pouches and films, packaging materials, cups etc.

Wet waste

Leftover on plate, long stored and decomposed food, fruit peels, vegetable cutting waste, slaughter waste, left over solids of kitchen and processing area washings etc.

10.2 METHODS OF FOOD WASTE DISPOSAL

Food waste management has now become a global issue. The socio-economic factors are mainly responsible for generating huge amount of food waste all over the world. Food waste is considered easily disposable material, but it should be kept in mind that disposal of such food waste should not have any adverse effect on health and environment. Different disposal methods are being in practice, which are discussed below.

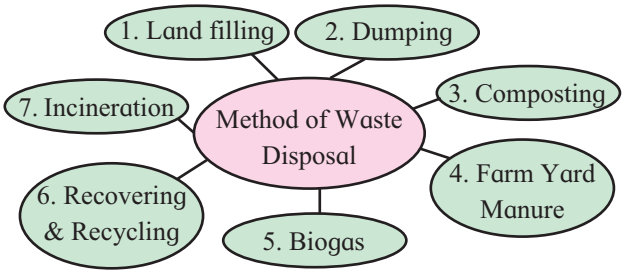


Fig. 10.1: Methods of food waste disposal

1. Landfills: An area of land is selected and it is filled with wastage in a layered manner. The waste is covered with soil or wood chips for layer formation. It is the most easy and economical method. But, landfills give rise to air and water pollution which severally affect the environment.

Fig. 10.2: Land filling

2. Dumping: The garbage and waste is collected through garbage collecting vehicles and dumped in open barren space, lying there for many days. Sometimes, the waste is dumped in sea, river, lake, etc. This method of disposal creates severe problems of pollution and hence it is now being less practiced. It will promote anaerobic fermentation by bacteria and there by the decomposition and disposal is carried out.

Fig. 10.3: Dumping

3. Composting: Composting provides an alternative to landfill disposal of food waste. It requires large areas of land and produces volatile organic compounds. It is natural way of bio-degradation of waste and converting it into a compost which is an organic material that can be used as manure to grow plants. Manure compost (humus) is created by combining food waste with bulking material like fodder waste. It is dark brown or black and has an earthy smell.

Fig. 10.4: Composting

An ideal method of composting food waste is vermi-composting. The moist waste mass is mixed with earthworm culture, moistened, covered, sprinkled with water intermittently and is kept covered for about 30 days. The compost is taken out in dry form, sieved and then used as manure.

Fig. 10.5: Vermi composting

4. Farm yard manure: It is the method of composting farm waste. A mixture of dung and urine of animals along with the left over fodder materials, food waste, and kitchen waste is decomposed in a pit. It takes 4-5 months to create manure out of it. It makes available good nutrients for plant growth.

Fig. 10.6: Farm yard manure

5. Biogas: The farm waste, food industry waste, municipal wet waste, hotel industry waste, etc. are disposed of by decomposing it along with cow dung in a close chamber (pit) known as biogas plant. During the process, the cellulose material in the waste is decomposed by the bacteria from cow dung slurry into the methane gas, which is used as fuel gas. The slurry coming out of the plant is dried and used as farm manure.

Fig. 10.7: Biogas plant

6. Recovery and recycling: Recovery is the process of taking useful material from the discarded items for a specific next use. The discarded items are then processed to extract or recover new materials and resources or convert them to energy in the form of heat, electricity or fuel (co-generation plant).

Some food waste are being utilized for various by-products like, fruit skin waste for colour and flavour extraction, grain milling waste (bran and germ) for oil extraction, dairy waste for protein extraction, etc.

7. Incineration: It is the type of waste disposal method in which solid wastes are burned at high temperatures so as to convert all organic matter into gaseous products and inorganic matter into ash. It reduces the volume of solid waste to 20-30% of the original.

Fig. 10.8: Incineration

10.3 UTILIZATION OF FOOD WASTE FOR MANUFACTURING BY-PRODUCTS

Food processing is always considered as a tool to address challenges of rapid changing food habits and requirements. But on the other side one should also explore the scope to utilize food waste to manufacture by-products. Some of the examples of use of food waste in manufacturing by-products are listed below in the table 10.4.

Table 10.1: Utilization of food waste into by-products

Sr. No.	Food waste	Food or functional use
1	Banana peels	Pectin extraction
2	Pineapple pomace	Bromelain enzyme extraction
3	Pomegranate peels	Antioxidant and preservative
4	Tomato peel	Lycopene extraction
5	Carrot pomace	β-carotene extraction
6	Sugarcane waste (molasses)	Alcohol production
7	Grape pomace	Antioxidant
8	Grain bran	Bran oil
9	Grain germ	Germ oil
10	Soymilk residue (okara)	Halwa and other sweets
11	Whey	Beverage and whey protein
12	Waste cooking oil	Biodiesel
13	Egg shell	Calcium production
14	Shrimp shell & fish scale	Chitosan extraction
15	Animal skins and hides	Gelatin

10.4 Consequences of food waste

Improper management of food waste leads towards following consequences

1. Loss of utilizable (valuable) food resources
2. Loss of nutrients and natural functional ingredients
3. Severe problems of disposal and transportation
4. Due to improper disposal air, water, atmosphere (environment) get severely polluted
5. Emission of toxic gases– increased carbon footprint
6. Loss of soil fertility and cultivable land (soil remains waste land)
7. Biodiversity loss due to deforestation for creating cultivable land
8. Economical loss to the manufacturer due to less yield and high processing cost
9. Financial loss to community and government due to increased expenses on disposal

Do you know ?

Carbon footprint is the amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organisation or community.

Points to remember

- Food waste is a food that is wasted or lost uneaten or unused.
- Based on type of industry food waste is classified as food service industry waste and food processing industry waste.
- Based on nature of waste food, waste is classified as dry and wet waste.
- The food waste generated at each stage of handling and processing of food is termed as post harvest wastage.
- The nature i.e. dry or wet decides it's utilization and disposal method.
- Food waste can be disposed by land filling, dumping, composting, incineration, etc.
- Biogas and farm yard manure can be produced from food waste.
- The food waste can be recycled and used to recover new materials.

Exercise

Q. 1 a. Select the correct option from given choices.

i. For dry waste _____ colour code is used

a. Green b. Pink

c. White d. Blue

ii. _____ is a method in which waste is burned

a. Composting b. Dumping

c. Incineration

d. None of the above

iii. Home kitchen waste does not include

a. Hotel waste b. Canteen waste

c. Both a & b

d. None of the above

iv. Banana peel is used for

a. Alcohol production

b. Pectin extraction

c. Oil extraction

d. Lycopene extraction

v. Manure compost is called as,

a. Human b. Humus

c. Humud d. All of the above

b. Match the correct pair.

	A		B
i.	Carbon footprint	a.	Gelatine
ii.	Waste cooking oil	b.	Blue colour
iii.	Wet waste	c.	Antioxidant
iv.	Animal skin	d.	Toxic gas
v.	Grape pomace	e.	Biodiesel
		f.	Green colour

c. Do as directed.

i. Select the odd word

Pink Bin, Blue Bin, Green Bin

ii. Complete the word

B		O			S

Clue: I am a method of food waste disposal

iii. Unscramble the word

Clue : I am an enzyme present in pineapple

MABOILNRE

Q. 2 Answer the following questions.

i. What is composting?

ii. Define food waste

Q. 3 Write Short notes on the following.

i. Classify food waste

ii. Write the consequences of food waste

iii. Example of food waste utilization

Q. 4 Long answer question.

i. Enlist and explain methods of waste disposal

ii. Write a note on food waste management.

Project :

Prepare a report on types of waste found at domestic level and classify them into dry waste and wet waste

Unit - 5

Food Service Management

Objectives

- To understand food service industry and its types.
- To study work place, personnel and menu management in food service industry.
- To acquire knowledge about basic Indian cuisines.
- To create awareness about instruments and different techniques being used in Indian cooking.
- To learn different types of gravies.

"The quality of service rendered will be remembered long, after the price has been forgotten"

The food service industry encompasses all of the activities, services, and business functions involved in preparing and serving food to people eating away from home. This includes all types of restaurants from fine dining to fast food. It also includes institutional food operations at locations such as schools and hospitals, as well as other specialty vendors such as food truck operators and catering businesses. Food and service management providers support a number of wider industries ranging from traditional hospitality based industries (such as hotels and restaurants), to other areas (such as education and army). The Indian food services market space is attracting significant interest from domestic as well as international private equity and venture capital funds.

11 Food Service Industry

Content

The modern concept of preparing food as a craft and a form of business can be traced all the way back to at least the 11th century with medieval guilds.

While the concept of designated cooks and bakers preparing food for others had been around for centuries, there was no standardization or common organization to the profession.

Do you know ?

In the early 19th century, a Frenchman by the name of Marie-Antoine Carême played an important role in the shaping of culinary artistry.

Food services emerge as a key segment in Indian economy. Indian food services market is estimated at INR 3,37,500 crore in 2017 and is projected to grow at 10% growth rate.

Two mega metros, Mumbai and Delhi contribute to 22% of the overall food services market (11% each) followed by six mini metros (Pune, Ahmedabad, Bengaluru, Chennai, Hyderabad and Kolkata) comprising of 20% share in the food services market.

The large number of investments can be attributed to the fact that the food services market is a domestic consumption driven story with great growth potential.

11.1 TYPES OF FOOD SERVICE INDUSTRY

Food services industry is classified in two segments: a) organized and b) unorganized, and is based on following three key parameters:

(i) Accounting transparency

(ii) Operations with quality control and sourcing norms

(iii) Outlet penetration

The food service outlets that conform to the above three key parameters are ‘organized’ segments (E.g. Dinning, quick service restaurants, food courts, cafe etc.) and those do not conforms are ‘unorganized’ segments (E.g. Roadside vendors, dhabas, food carts, street stalls, etc.).

Organized segments are further classified in standalone and chained formats.

Standalone formats are the organizations with a single outlet across the country owned by the owner, and are generally domestic formats.

Chained formats are domestic and international formats with more than three outlets present across the country.

Depending upon price (average price per person), service quality and speed, and product offered; the organized segment is sub categorized into following sub-segments.

Table 11.1: Sub-segments of Organized Indian Food Service Industry

Segment	Description
Fine Dining Restaurants (FDR)	A full service restaurant with premium interiors, specific cuisine specialty and high standard of service. They offer a unique ambience and an upscale service with the help of highly trained staff.
Affordable Casual Dining Restaurants (ACDR)	A restaurant serving moderately priced food in an ambience oriented towards providing an affordable dining experience, with table service.
Premium Casual Dining Restaurants (PCDR)	Restaurants bridging the gap between ACDRs and FDR. Full service restaurants with high quality interiors and high standards of service.
Pubs Bar Club & Lounge (PBCL)	This format mainly serves alcohol and related beverages and includes night clubs and sports bars.
Quick Service Restaurants (QSR)	Focused on speed of service, affordability and convenience. Strong focus on takeaway and delivery with minimal table service.
Café	Coffee and chai bars as well as parlours and bakeries. High focus on beverages supported by food items.
Frozen Desserts/ Ice-Cream	Comprises small kiosk formats of ice-cream brands and has now extended the dine-in concept to frozen yogurt brands.

Source: Indian food services industry: Engine for economic growth and employment, FICCI

11.2 WORKPLACE MANAGEMENT IN FOOD SERVICE INDUSTRY

Food service industry needs a detailed planning for smooth performance. It is essential to check whether the services are well planned and the staff can deliver quality work or not.

Definition:

Workplace management is a series of activities for planning, designing, using and disposing items surrounding the workplace for the purpose of helping employees to orgnize their daily task and optimise the use of resources and facilities.

The components which decide the effectiveness of service establishment is workplace management, which can be get controlled by proper workflow in food area.

The growing trend in the food industry where the food is prepared in kitchen, packed and then distributed have created a need of optimal space utilization. Hence, it very important to design the kitchen to increase efficiency and manage the space in such a way that individual person will work safely.

Workplace management is carried out by keeping three points in mind i.e. health, hygiene and safety. Effective workflow in food area can be achieved by following way.

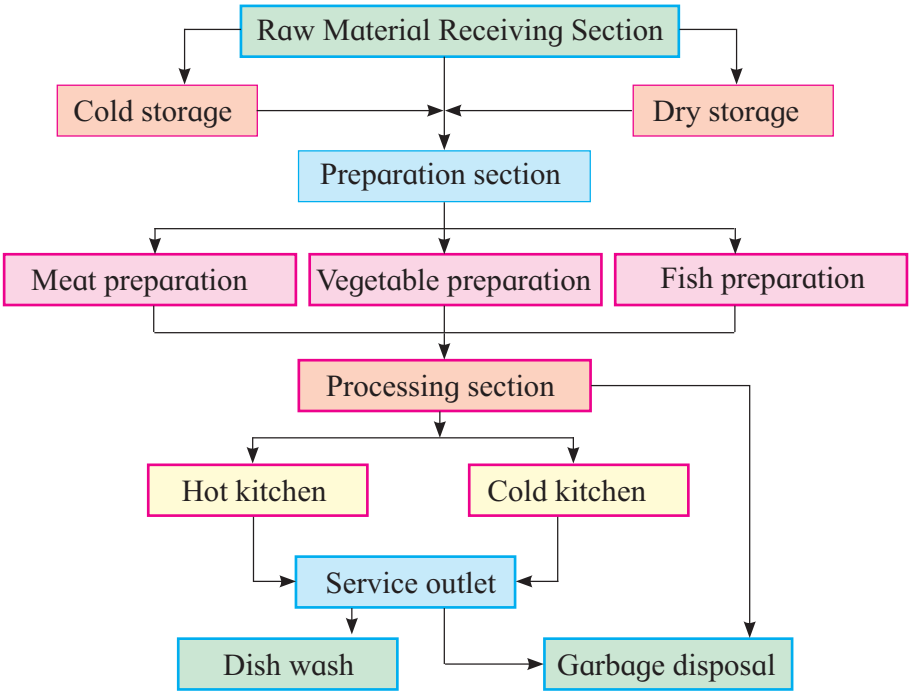


Fig. 11.1: Workflow of food service sections

The flow of the product, starting from raw material reception to the service area should be taken care of. The raw material come from market and is distributed from receiving area to various section according to nature and intended use of the material. The segregation of material is to avoid cross contamination with each other.

Preparation section is the area where the received material is primarily processed so as to convert the raw material in to storable and usable form.

According to the requisition by concern kitchen i.e. either hot or cold kitchen prepared material is supplied. Care is taken in storage section to avoid storage waste. The material is distributed in First-In-First-Out (FIFO) manner.

Food processing section should be planned in such a way to maintain easy workflow in order and delivery of food.

The following points should be considered while allotting the space for each work.

Allocation of Space

Time and Motion
The staff should not move too much as it will lead to more work load, more efforts and more process time.

Layout of cooking area
The areas and section of industry should be located for easy connectivity and avoid crossovers between raw and cooked food.

Utilization of space
The space should be utilized to maximum and should be fixed according to requirement of particular job to do it safely and effectively.

No crossovers
The flow of work should be unidirectional. This will help to reduce crossovers of jobs and avoid disturbances.

Type of establishment
The menu, style of service and kind of customer decide the type of food service industry and space requirement vary according to the type.

Design and type of equipment
Each job requires different equipment and tools. Selection of equipment should be based on suitability to the type of establishment and space availability.

Fig 11.2: Points to consider in workplace space allocation

11.3 PERSONNEL MANAGEMENT IN FOOD SERVICE INDUSTRY

No matter how tasty the menu is, customers will not come back if they have bad experiences with customer service. For this reason, a staff comprising trained and skilled personnel is necessary. Human resource department of the industry does staffing and resourcing of employee and it mainly depends upon style and size of service industry, menu and civic laws. The food service industry personnel with their job description are as below.

Food and beverage manager

The food and beverage manager is either responsible for the implementation of agreed policies or for contributing to the setting up of the food and beverage policies.

Restaurant manager or supervisor

The restaurant manager or supervisor has overall responsibility for the organization and administration of particular food and beverage service areas.

Reception headwaiter

The reception headwaiter or receptionist is responsible for accepting bookings and for keeping the booking diary up to date.

Headwaiter/Supervisor

The headwaiter has overall charge of the staff team and is responsible for seeing that the pre-preparation duties necessary for service are efficiently carried out.

Station headwaiter/Section supervisor

For larger establishments the restaurant area is broken down into sections. The station headwaiter has overall responsibility for a team of staff serving a number of stations within a section of the restaurant area.

Station waiter

The station waiter provides service to one set of tables (known as a station) within the restaurant area. The station waiter will take the food and beverage orders and carry out service at the table with the help of the waiter.

Waiter

Serve food and beverages to the customer or supply the guest with food and drink as requested. During the preparation period, the waiter will carry much of the cleaning and preparatory tasks out.

Fig 11.3: Food service industry personnel with their job description

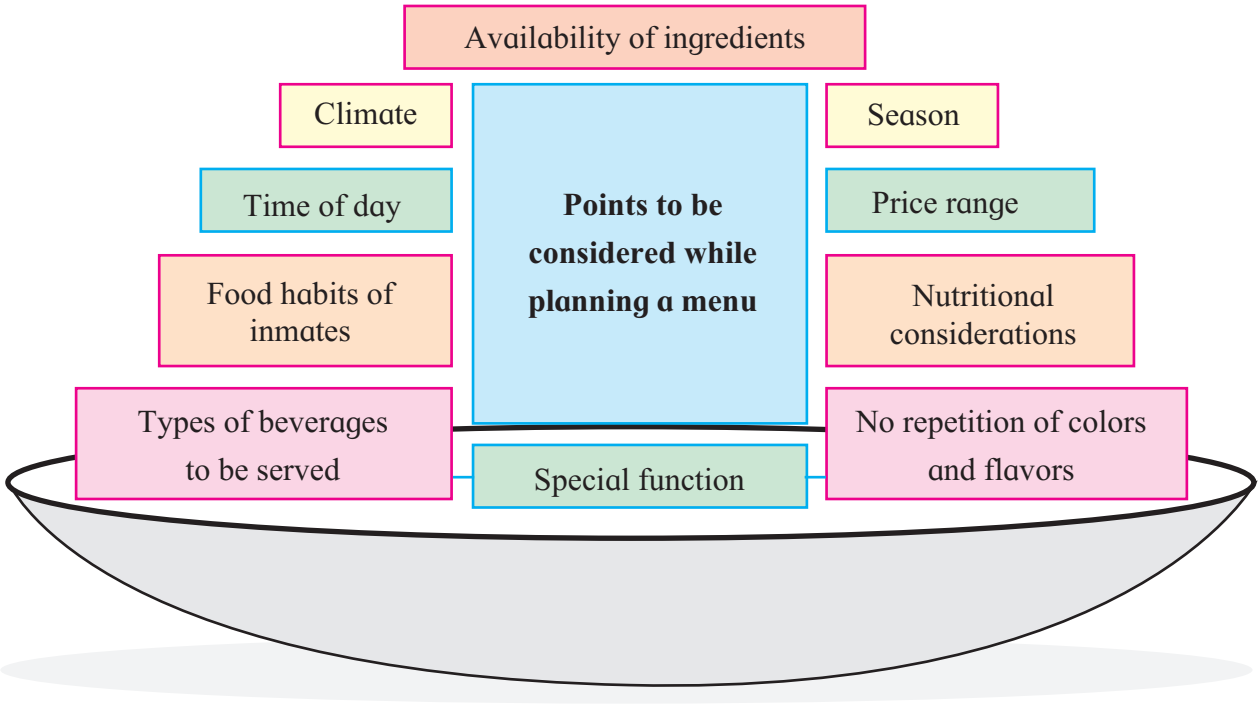
11.4 MENU MANAGEMENT IN FOOD SERVICE INDUSTRY

The success of the organization is determined by the menu and how well the various items are prepared and served. A menu is a means of communication by which the caterer/food service unit, whatever type it may be, informs the customer/consumer what food items are being offered.

The menu of any food service establishment essentially performs two functions

1. Inform customer about what is available

2. Inform catering staff what is to be prepared



Menu balancing:

The most delectable and well-cooked food might not be appreciated by the guests, if it is not been served in right portion size with the right accompaniment. While balancing menu one should think about following three aspects.

a. Business balance:

Balance between food cost, menu price etc.

b. Aesthetic balance:

Balance between colour, flavour, texture etc.

c. Nutritional balance:

Balance between major and minor nutrients.

Can you recall ?

Balanced Diet:

A balanced diet is one which contains variety of foods in such quantities and proportion that the need of all nutrients is adequately met for maintaining health, vitality and general wellbeing.

Types of menu:

Every food service establishment is unique in their menu. The menu may get changed or may not get changed in some establishments. Hence, it is important to adopt a product list display system to inform the customer what is being served in the establishment. The product list along with the price can be informed by following way.

The Cycle Menu

A cycle menu is a list of menu items or dishes that is changed each day during the cycle and repeated. These menus are usually found in institutional facilities, schools and cafeterias, although some restaurants use them as well.

Du Jour Menu

Du Jour means "of the day' so salad du jour means "salad of the day". Du jour menus are sometimes called chalkboard menus, and are changed frequently and concentrate on seasonal ingredients.

À La Carte

In French, à la carte literally means "by the menu". The A la carte menu prices each food item separately; it often contains greater choices for the customer. Although the price of A la Carte items are more expensive.

Prix-Fixe Menu

The prix-fixe menu offers numerous courses for a fixed price tag. Prix-fixe menus are usually found only in fine dining restaurants. A prix-fixe menu is also called the "degustation menu" or the "chef's tasting menu".

Static Menu

Static menus are offered all-year long. The menu get changed or updated very rarely. This type of menu is most prevalent in fast-food restaurants. The range of product is limited.

Wine/Beverage Menu

Many restaurants offer a beverage and wine menu for their customers. These menus often include specialty wines, teas, coffees, and cocktails. There may be suggestions on which wine best accompanies a particular meal.

Fig 11.4: Types of menu with their description

Points to remember

- Food services emerge as a key segment in Indian economy.
- Food services industry is classified in two segments: a) organized and b) unorganized
- Stand-alone formats are the organizations with a single outlet across the country owned by the owner, and are generally domestic formats.
- Chained formats are domestic and international formats with more than three outlets present across the country.
- Workplace management is carried out by keeping three points in mind i.e. Health, Hygiene and Safety.
- The menu of any food service establishment essentially performs two functions
  1. Inform customer about what is available and 2. Inform catering staff what is to be prepared

Exercise

Q. 1 a. Select the correct option from given choices:

i. The growth rate of food service industry is projected to _____

a. 10% b. 15%

c. 20% d. 25%

ii. Food Service Industry is classified as

a. Organized b. Unorganized

c. Both a & b

d. None of the above

iii. Allocation of space does not depends upon _____

a. Product Price b. Equipment

c. Crossover d. Establishment

iv. Food Service Industry Personnel dose not include _____

a. Waiter b. Customer

c. Supervisor d. Manager

v. _____ balance is the aspect of menu balancing

a. Business b. Aesthetic

c. Nutritional d. All of the above

b. Match the correct pair:

	A		B
i	Cafe	a	Serve Food
ii	Chalkboard Menu	b	Single Outlet
iii	Standalone	c	Organized
iv	Colour	d	Du Jour Menu
v	Waiter	e	Aesthetic Balance
		f	A La Carte

c. Do as directed:

i. Select the odd word

Road side vendor, dhaba, fine dine restauratant, food cart

ii. Fill in the blank

First ____ First _____

iii. Who am I?

Clue: I am responsible for accepting bookings and keeping booking diary up to date,

_____

Q. 2 Answer the following questions:

i. What is menu balancing?

ii. Give types of food service industry

Q. 3 Write Short notes on the following:

i. Types of menu

ii. Allocation of space

iii. Food service industry personnel

Q. 4 Long answer question

i. Expalin in detail about workplace management

ii. Explain in brief menu management

Project :

Visit to near by restaurant or hotel and peapre a project report.

12 Basics of Indian Cuisines

Content

The cuisine of India is a result of 5,000 years of history, of interaction between the sub-continent and multiple other outside influences, such as the Mughals, British and Portuguese. Indian food has made a complex journey and with advent of globalization, it has carved its own place in world's cuisine. In Indian tradition, food is placed next to God and that is the reason why it is a integral part of our various religious and other ceremonies.

12.1 CUISINE: INDIAN CUISINE

A **cuisine** is a style of cooking characterised by distinctive ingredients, techniques and dishes. It is usually associated with a specific culture or geographic region.

Indian cuisine is the general term for the wide variety of cooking styles from India. Indian food is mostly prepared with fresh ingredients along with delicate mixtures of many different fresh and dried spices. The exact recipes often vary greatly from one household to the next.

Fig. 12.1 : Indian Cuisine

Do you know ?

Indian food is born from the concept of Ayurveda, an ancient body of knowledge on health. Ayur is derived from the word ayus meaning span of life in Sanskrit, and Veda means knowledge. Thus Ayurveda is the knowledge concerning the maintenance of long life.

Fig 12.2 : Ayurveda

Factors influencing a region's cuisine :

Cuisine of any region is varied and diverse. In every region, food changes it flavour and techniques of cooking. There are many factors that influence the cuisine of any region.

They are:

1. Area's climate
2. Trade among different countries
3. According to religious laws
4. Culinary exchange

12.2 TECHNIQUES EMPLOYED IN INDIAN COOKING

Cooking anywhere in the world use a universal method, which is the use of some form of heat to bring raw food to an edible form. There are different types of cooking methods used to cook food. Frying, boiling, sauteing, grilling are some of the most popular methods used to cook food.

Indian cooking is vast and uses all the above methods and more. The difference lies in how the techniques are applied during the cooking process. For example, the sauteing cooking method is used in almost every cuisine including cooking Indian food. The difference is that sauteing in Indian cooking involves cooking on a low flame with the addition of a dash of water from time to time to prevent the spices or the base sauce from burning.

If we compare it to other cuisines that use sauteing method for cooking, like Chinese or just sauteing vegetables, it will mostly require to stir continuously on medium heat without any additional water.

There are subtle changes in techniques that one needs to become familiar with to bring out the typical Indian flavours.

1. *Bhunao* (Preparation of Masala):

- This method is combination of sauté, stir-frying and stewing.
- Used in preparing most of the Indian dishes.
- Add ginger-garlic paste, ground spices and tomatoes. Saute on medium heat adding splashes of liquid. Stir until oil separates.
- Add meat or vegetables to it.
- E.g. *Bhunna Murg* (Chicken masala).

Fig 12.3 *Bhunao* technique

2. *Dum* (Cooking of food in its own steam):

- *Dum* means to 'breathe in' and *pukht* means to 'cook.
- *Dum pukht* cooking uses a round, heavy-bottomed pot, preferably a *handi* (clay pot), in which food is sealed with dough and cooked over a slow fire.
- Cooking in *dum* style gives a unique aroma of the spices and the food is just perfectly tender.
- E.g. Chicken *dum Biryani*, *dum* aloo, *dum karela*, *dum pukht Biryani*.

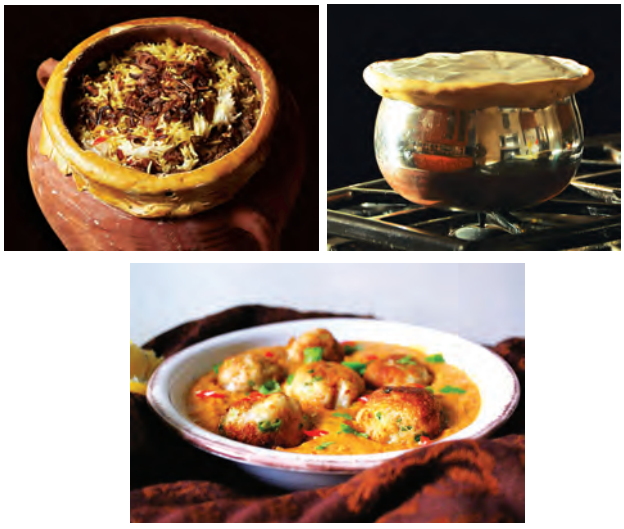


Fig 12.4 *Dum* technique

3. *Talna* (Frying):

- This term is used for frying in Indian cuisine.
- Usually done in *kadhai* (pan).
- Depending on the type of dish it is shallow or deep fried.
- E.g. *tikki*, cheese balls, cutlets, etc.

Fig 12.5 *Talana* technique

4. *Baghar* (Tempering):

- It is also known as *tadka* in north India, *baghar* in west India, *chonkhna* in central India and *phodni* in Maharashtra.
- This technique comprises to add more spices, tomatoes, garlic, onion, ginger into an already cooked food to make it more spicy and delicious. All these ingredients are fried in ghee or cooking oil.
- Main function is to flavour a dish with aromatic spices.
- E.g. *dal tadka*, *kadhi*, etc.

Fig 12.6 *Baghar* technique

5. *Dhungar* (Smoking):

- *Dhungar* is an ancient technique of smoking and infusing the flavour of burnt charcoal smoke into a dish.
- In India while giving *dhungar,* oil or ghee is poured over burning hot charcoals.
- Spices such as clove are also used to impart a flavour.
- Some red-hot charcoal is kept in a small cup in the middle of the food. Ghee is poured on it. The pan is covered and let it rest for a few minutes. Uncover it and remove the charcoal before serving.
- E.g. *dal*, fish, meat and meat products.

Fig 12.7 *Dhungar* technique

6. *Tandoor* (Roasting/Baking):

- A tandoor is a clay oven (*bhatti*) that is used to cook *naan* or *roti* using a hot charcoal fire.
- The food cooked in a tandoor oven is roasted, baked and smoked.
- E.g. *tandoori roti*, *naan*, *tandoori* chicken, *seekh kababs*, etc.

Fig 12.8 *Tandoor* technique

7. *Bhapa* (Steaming):

- Steaming works by boiling water continuously, causing it to vaporize into steam.
- The steam then carries heat to the nearby food, thus cooking the food.
- E.g. *Idli, momos, modak*

Fig 12.9 *Bhapa* technique

Do you know ?

Indian food system classifies food into three categories – *Saatvic* (fresh vegetables and juice), *Raajsic* (oily and spicy food) and *Taamsic* (meat and liquor).

12.3 EQUIPMENTS USED IN INDIAN COOKING:

Indian cuisine is most popular because of its taste, aromatic spices and cooking methods. In Indian cooking a wide range of equipments are used. The quality of end product also depends on the type of equipments used. While cooking a specific regional dish, it sometimes require unique cooking utensils and aids. Therefore the list of Indian equipments is also endless, but there are some basic tools which are used essentially everywhere.

Table 12.1 Commonly used equipment in Indian cooking

Name	Photograph	Description
Iron pan (*Tawa*)		A tawa is usually made up of cast iron. It is a flat base equipment, used for baking Indian breads like *rotis, parathas, etc.*
Rolling pin and board (*Polipat and latana*)		In Indian cuisine the rolling pin and board are aslo known as *chakla* and *belan*. It is used for rolling the dough into *roti, paranthas, puri,* etc. Rolling pin and board are available in wooden, stone, steel material etc.
Tongs (*Chimta*)		They are a pair of long tongs. Often made from iron or stainless steels they are used to flip the *roti* on the *tawa* or to hold food on open flames like papad.
Sieve/ strainer (*Chhalni*)		It is a round utensil consisting of a wire or plastic mesh held in a frame used for separation of fine particles from coarse one.

Shredder (*Khisni*)		It is also known as grater. It has different types of grating holes and thus help in preparation of variety of foods.
Round spatula with holes *(Jhara)*		Jhara is an incredibly useful tool, while deep frying the food in kadhai. Jhara is a large round spatula with holes which allows the oil to drain out.
Skillet *(Kadhai)*		Kadhai is the Indian version of a wok. It is a thick, circular and deep cooking pot. Traditional kadhai was made from cast iron, however now they are available in a variety of different non-stick and stainless steel versions.
Degchi or deg (Handi)		One of the most common utensil used in Indian cooking. It is a pear shaped pot made up of brass, copper or aluminium. It is ideal for *dum* cooking.
Bhagona or patila (Patela)		A bhagona or *patila* is a utensil accompanied with a lid and used extensively in Indian cooking. It is usually used in boiling and simmering.
Agitator *(Ravi/Dal ghotni/ Mathni)*		It is a special wooden equipment which is used to churn curd to make lassi or buttermilk.
Flat stone grinder *(Pata-varavanta/ Silbatta)*		There are two pieces of stone- one is flat called the *pata* and the other is rod shaped called *varavanta.* A traditional *Pata-varavanta* is mainly useful to prepare spice mix or masala (garlic, ginger, onion, etc.) or *chutneys.*

Mortar and pestle *(Khalbatta)*		It is made up of wood, marble, stone, steel or ceramic. It is used for pounding herbs, spices and *chutneys*.
Spice box *(Masalyacha Dabba)*		*Masala dabba* is one of the most fundamental tools in any Indian kitchen, containing many cups in one box. Each cup contains different, regularly used dry spices - both in whole and powdered form.
Spatula/ flat spoon *(Ulatne)*		It is a flat metal or wooden spoon used for scrapping and turning the food to cook the both sides.
Pressure cooker		Pressure cookers are used for cooking food faster. It saves time and energy than a conventional method.

12.4 BASIC INDIAN GRAVIES

Indian cuisine comprises of a number of regional cuisines. These cuisines differ from each other mainly due to the use of locally available spices, herbs, vegetables and fruits. Indian food is also influenced by religious and cultural choices and traditions.

In Indian cuisine, the word gravy and curry are used interchangeably, which gives the feeling of aromatic spicy food. Gravy contain various spieces which impart flavour, thickness and colour to the food item.

Definition: Indian gravy is a smooth liquid of thick consistency, which imparts body, taste, richness to any Indian food preparation. It is the heart and soul of Indian cuisine.

In general there are four types of Indian gravies that are commonly used to prepare many dishes.

- Onion tomato masala
- Makhni gravy
- White gravy
- Hariyali gravy

A. Onion tomato masala:

The basic onion tomato gravy is the base for most curries in India. It is also known as brown onion gravy.

Fig 12.10: Onion tomato masala

Preparation:

1. Heat oil in the utensil (*kadhai*).
2. Temper with *khada masala* and slit green chillies.
3. Add chopped onions and cook until slightly darker than golden brown.
4. Do not burn the onions as it gives a bitter taste.
5. Add ginger and garlic paste and cook for a minute.
6. Make a paste of red chilli in water, add it to the onion mixture and cook on low flame.
7. Add chopped tomatoes and cook.
8. Add small amounts of hot water into the gravy and keep mashing the onion and tomatoes to form a thick gravy.
9. Cover it and cook for a while until the oil separates and the colour darkens.
10. This gravy can be used in number of dishes.

Usage and storage:

This gravy is used in number of Indian dishes. It forms the base for many curries and dishes. This gravy is usually made fresh for each dish in every Indian home and used in everyday cooking. It can be stored upto one week in a refrigerator. It can be used in *palak paneer, rajma, chole* and meat preparations.

B. Makhni gravy:

It is very popular in Indian cuisine. It is mainly used in preparations like chicken *makhni*, *paneer makhni*, mushroom or *kofta makhni*. As the name suggests, cream and butter used to prepare this gravy gives it the name *makhni*.

Fig 12.11: *Makhni* gravy

Preparation:

1. Make a slit on the surface of tomatoes with a sharp knife.
2. Put them in a pot with small amount of water, add crushed ginger and garlic and cook them till it becomes soft.
3. Make puree and strain the mixture and keep aside.
4. Heat the butter, add red chilli powder and cook for some time.
5. Add the above mixture, salt, garam masala, green chillies and cover it and cook till oil separates on the surface.
6. Add cashew nut paste, roasted and powdered *kasoori methi* and sugar.
7. Add more butter if required and finish with cream.

Usage and storage:

It is mainly used in many curries and dishes. Basic *makhani* gravy is a silky, buttery, creamy, tomato based gravy and is commonly used in many veg and non-veg recipes. It can be kept in refrigerator in a closed container for about one week.

Do you know ?

Cream should be added at the end and gravy should not be boiled after that as it might result in curdling.

C. White gravy:

This gravy is white in colour. The base of this gravy is boiled onion paste and the gravy is thickened by nut pastes.

Fig 12.12: White gravy

Preparation:

1. Heat ghee in utensil.
2. Temper with *khada masala* and slit green chillies.
3. Add ginger–garlic paste and saute for about a minute.
4. Add boiled onion paste and cook until ghee comes out.
5. Cook on a slow flame and ensure that the onions do not gain colour.
6. Add cashew nut paste and magaz paste (melon seed paste) and cook for another minute.
7. If required, little hot water can be added at this stage.
8. Now add whipped curd and cook until the gravy comes to a boil.
9. Cover and cook until ghee comes on top.
10. The gravy is ready after 45 minutes.

Usage and storage:

This gravy is used in many dishes and curries. It is used as a base for *kormas*, where more curd and brown onion paste is added. This gravy is rarely used on its own, as it is very heavy. It is thus combined with *makhni* or *hariyali* gravy to create royal dishes such as *malai kofta, methi matar malai, navrattan korma,* etc. This gravy should be made when required as the nut pastes can make it sour and spoil rapidly.

D. Hariyali gravy:

Hariyali means green. This gravy is made by adding cooked spinach puree into brown gravy.

Fig 12.13: Hariyali gravy

Preparation:

1. Make the onion tomato masala.
2. When done, add spinach paste to the masala and cook without covering it until oil floats on top.

Usage and storage:

This gravy is used in many dishes around India. It can be stored for a week in a closed container in refrigerated condition.

Points to remember

- A cuisine is a style of cooking characterised by distinctive ingredients, techniques and dishes. It is usually associated with a specific culture or geographic region.
- Indian cuisine is the general term for the wide variety of cooking styles from India. Indian food is always prepared with fresh ingredients along with delicate mixtures of many fresh and dried spices.
- Indian food is born from the concept of Ayurveda, an ancient body of knowledge on health. Ayur is derived from the word ayus meaning span of life in Sanskrit, and Veda means knowledge.
- Indian cooking is vast and uses different methods. The difference in methods lies in how the techniques are applied during the cooking process.
- In Indian cooking a wide range of equipments are used. The quality of end product also depends on the type of equipments used.
- Indian gravy is a smooth liquid of thick consistency, which imparts body, taste, richness to any Indian food preparation. It is the heart and soul of Indian cuisine.

Exercise

Q. 1 a. Select the correct option from the given choices.

i. By using the technique dum while cooking, we mean using which method ?
   a. Saute c. Frying
   b. Steam d. Roast

ii. _____ is an example of Bhapa technique.
   a. Biryani c. Pappad
   b. Kheer d. Idli

iii. For preparation of roti we use _____
   a. Round spatula
   b. Chimta
   c. Rolling pin and board
   d. Jhara

iv. We use _____ for deep frying.
   a. Skillet (Kadhai) c. Degchi
   b. Tawa d. Patili

v. _____ is added to gravy which gives the name makhani.
   a. Onion c. Butter
   b. Tomato d. Cashewnuts

vi. The colour of Hariyali gravy is _____
   a. White c. Red
   b. Brown d. Green

b. Match the correct pairs.

A		B	
i.	Ayur	a.	Grater
ii.	Bhunao	b.	Green gravy
iii.	Baghar	c.	White gravy
iv.	Khisni	d.	Sauteing
v.	Hariyali gravy	e.	Tempering
		f.	Span of life

c. Do as directed:

i. Write true or false.

Degchi is ideal for dum cooking.

ii. By considering the first correlation complete the second correlation.

Talna: Tikki

Dum : _____

iii. Identify the odd word.

a. Modak b. Naan

c. Tandoori roti d. Seekh kabab

iv. Name the word with the help of clue:

Clue: It contains various spices in one box.

		I				O	

v. Who am i :

Clue : I am a flat base equipment used for making Indians breads (roti).

vi. Identify the object:

Q. 2 Answer the following questions briefly:

i. Define cuisine.

ii. List the factors affecting a region's cuisine.

iii. Name any four techniques employed in Indian cooking.

iv. Define Indian gravy.

v. Give the usage and storage of Onion tomato masala.

Q. 3 Write short notes on:

i. Explain Dum technique.

ii. Explain what do you understand by baghar?

iii. Explain the following with the help of diagram.

a. Chimta

b. Kadhai

c. Degchi

Q. 4 Long questions

i. Explain any two techniques of cooking.

ii. Write the ingredients of white gravy and explain its preparation, usage and storage.

Projects:

i. Select any ten recipes and make an album based on various techniques of cooking.

ii. Select any ten recipes and make an album based on the four basic gravies.

Glossary

Adulterants: Substance which lowers or degrades the quality of food material
Adulteration: Process of lowering or degrading the quality of food material
AGMARK: Agricultural Produce (Grading and Marketing) Act, 1937
Alcoholic beverages: Beverages containing alcohol produce by fermentation using yeast
Anthropometry: Measurement of human growth
Anticaking agent: Substance which avoid lump formation in dry powdered products
Antioxidants: Substances which inhibits the effect of oxygen (oxidation)
Bakery: Facility that produces and sell flour based baked food products. E.g. bread, cake, cookies etc.
Beer: Alcoholic beverage produced by fermentation of grain (malted barley)
Beverage: A liquid food product other than water suitable for human consumption. E.g. Tea, Juice, Beer etc.
BIS: Bureau of Indian Standards (1986)
Broiler: Chicken of age between 8-10 weeks kept for meat
Cancer: Group of disease associated with abnormal cell growth with potential to spread in body
Casein: Main protein present in milk
Composting: A natural way of bio-degradation of food waste and converting it in to compost
Confectionery: Food items that are rich in sugar (more sweet)
DART: Detect Adulteration with Rapid Test
Diabetes: Disease that occur due to high blood sugar level
Diet: Sum of food consumed by a person
Distilled liquors: Distillation of alcoholic fermented beverages to concentrate alcohol content
Dough maker: Machine used to knead a dough mechanically
ECA: Essential Commodities Act, 1955
EU: European Union
FAO: Food and Agriculture Organization
FBO: Food Business Operator
FDR: Fine dining restaurants with full service and premium interior
Finfish: Fish with fins (bony spine covered with skin)
Food Additives: Substances which are added intentionally to improve the quality of food product
Food Fortification: A process of adding small quantity of nutrients to improve the nutritional value of food
Food Waste: The portion of food which is wasted or lost uneaten or unused
Fruit pulper: Machine used for extraction of pulp from fruits
Fruit sorter: Machine used to differentiate fruits on the basis of different quality parameters
FSMS: Food Safety Management System
FSSAI: Food Safety and Standards Authority of India
Glycogen: Form of carbohydrate present in meat

Homogenization: Process of breaking down large fat globules into tiny fat globules in milk
HTST: High Temperature Short Time method of pasteurization of milk
Hypertension: The condition at which blood pressure is above the normal level
Incineration: Burning of solid waste at high temperature so as to convert in to gaseous products
ISI: Indian Standard Institute
ISO: International Organization for Standardization
Juice extractor: Machine that mechanically extracts juice from fruits
Lactose: Sugar specifically present in milk
Layers: Poultry birds kept for eggs
Lean fish: Fish having less than 2% fat
Leavening agents: Substance used for CO_2 gas formation in food products
Malnutrition: Impairment of health due to deficiency, excess or imbalance of nutrients in diet
Meat: The muscles of warm blooded terrestrial four legged animal used for human consumption
Milk: Biological secretion by mammary glands of mammal
***Mithai*:** It is a generic term for Indian confectionery products
Myoglobin: Red colour pigment in muscle of meat
Non-Alcoholic beverages: Totally free from alcohol or less than 0.5% percent alcohol by volume.
Nutritional status: Condition of health of person influenced by the intake and utilization of nutrients
Obesity: Medical condition in which excess fat accumulates in body
Oven: Thermally insulated chamber used for baking
PFA: Prevention of Food Adulteration Act, 1954
Poultry: All domesticated birds used as food (meat and eggs)
Preservative: Substance which extends shelf life of the food
Shell fish: Fish without skeleton but covered with hard shell
Shortening: Addition of fat to dough to make the product crispy
Skim milk: Low fat milk from which fat has been skimmed off (Fat range 0.5 to 2%)
SNF: Solid Not Fat
Soup: Liquid food generally served hot, that is made from grains, vegetables, meat and chicken stock, etc.
Sterilization: High temperature process to destruct all micro-organisms in milk
Sweeteners: Ingredients used to give sweet taste to product. E.g. Sugar, Honey, Corn syrup, etc.
Tandoor: A clay oven used to cook *naan* or *roti* using hot charcoal fire
UHT: Ultra High Temperature method of pasteurization of milk
WHO: World Health Organization
Wine: Alcoholic drink produced by fermentation of grape juice
WTO: World Trade Organization
Yeast: Natural leavening agent used in bread making to produce CO_2 gas

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