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FOOD SAFETY AND QUALITY CONTROL

Food safety and quality are important at the home level, but they are critical in large-scale food production and processing, as well as in freshly prepared and served food. The quality of food products is determined by sensory attributes, chemical composition, physical properties, levels of contaminants, shelf life, packaging, and labelling. Understanding these quality characteristics and being familiar with the appropriate measuring tools is necessary for quality control and the quality assurance of food products. Advancements in technology and processing, higher per capita incomes, better purchasing power, and increased consumer demand have led to the manufacture of a variety of processed and functional foods. The safety of such foods needs to be assessed. In this lesson, we shall learn about the concept of food safety, different hazards involved in food safety management systems and practices, methods of food quality control, and the concept of food adulteration, including the different adulterants present in foods.



LEARNING OUTCOMES

After studying this lesson, the learner:

- identifies the characteristics of food quality;
- interprets the concept of food safety;
- differentiates between quality control and quality assurance
- evaluates various food safety management practices like GMP, GHP, HACCP; and
- discovers the features and functions of national and international food quality certifying bodies.

Food Processing and
Value Addition

Notes**19.1 FOOD QUALITY**

Quality is a term that denotes a degree of excellence, a high standard, or value. The quality of food may be defined as the combination of characteristics that differentiate individual units of a product and have significance in determining the degree of acceptability.

19.1.1 Characteristics or Attributes of Food Quality**A. Physical Characteristics**

Appearance and color are important physical characteristics of food quality, described as follows.

❖ Appearance

Factors such as size, shape, defects, and color are important appearance attributes that greatly influence the initial consumer acceptability of food products.

❖ Color

Color is a quality factor that significantly influences the appearance of a product. It is a characteristic of light, measurable in terms of intensity and wavelength.

B. Chemical Characteristics

The nature and amount of substances in a given food product determines its nutritive value and other properties. The analysis of the molecular composition of food substances is used to study the protein, fat, carbohydrate, ash, and water content of foods.

❖ Moisture Content

Moisture content is the most significant constituent in food products. As a medium, water supports chemical reactions, and therefore, removing moisture from food inhibits the growth of microorganisms, improving the shelf life of several food products. The following Table 5.1 provides an indication of the moisture content in different food products.

Table 19.1 Moisture content of different food products

Products	Moisture content (g/100g)	Products	Moisture content (g/100g)
Meat	65-75	Butter	16-18
Milk	87	Margarine	16-18
Fruit	70-90	Cereal flour	12-14
Vegetable	70-90	Coffee beans, roasted	5
Bread	35	Milk powder	4
Honey	20	Edible oil	0



Notes

- **Fat and Oil Content**

Fat and oil quality depend on the composition of the food product, the size of the product, the type of processing, and the type of oil used. Higher fat products are more susceptible to rancidity, which is defined as the amount of free radicals that can cause an off-odor or off-flavor in foods.

- **pH-Acidity**

The pH is an indicator of the amount of acid or base present in a food. pH also affects flavor, color, and texture and is measured using a pH meter.

- **Pigments**

Pigments are compounds in food that give them color. For example, the green color of vegetables is due to chlorophyll, and the red color in tomatoes is due to lycopene.

19.1.2 Effect of Microorganisms

There are many types of microbes that can cause food borne diseases. These are discussed below:

- **Bacteria**

Bacteria are the most important microorganisms for food processors. There are thousands of species of bacteria, but all are single-celled and fall into three basic shapes: spherical, spiral and rod.

Food Processing and
Value Addition

Notes

- **Yeasts and Molds**

Yeasts are oval-shaped and slightly larger than bacteria. Yeasts and molds grow on most foods, equipment, and building surfaces where there are small amounts of nutrients and moisture.

- **Viruses**

Viruses are the smallest and simplest microorganisms. They are capable of infecting closely related species.

19.1.3 Sensory Attributes

Consumers accept food based on certain characteristics that they define and perceive with their senses. These attributes are sometimes referred to as qualitative or sensory qualities. They include color, size, shape, and physical aspects; other factors such as texture, viscosity, consistency, finger feel, and mouth feel; and flavor factors or sensations combining odor and taste.

- **Appearance and Color**

Color and other aspects of appearance influence food appreciation and quality, especially by the consumer.

- **Texture**

Texture can be described as the properties of a foodstuff that are sensed by touch in the mouth and with the hand.

- **Taste and Flavor**

When food is consumed, the interaction of taste, odor, and texture provides an overall sensation that is best defined by the term “flavor”. Flavor is the most important sensory property of many food products.



INTEXT QUESTIONS 19.1

1. Quality is a term that denotes
2. Examples of physical properties determining food quality are
3. Color is a character of light, measurable in terms of and



4. Rancidity is defined as
5. The pH is an indicator of the amount of..... or present in a food.
6. are the compounds in food that give them color.
7. Three basic shapes of bacteria are, and
8.are the smallest and simplest microorganisms.

19.2 METHODS OF FOOD QUALITY CONTROL

Quality control involves maintaining the standards that ensure food products meet the acceptable quality criteria of customers. The primary objective of food quality control is to protect the consumer. To ensure consistency and standardization of these procedures, food laws and regulations cover various aspects, including marketing, production, labeling, use of food additives, dietary supplements, enforcement of good manufacturing practices (GMPs), hazard analysis and critical control points (HACCPs), federal laws and regulations, factory inspections, and import/export inspections.



INTEXT QUESTIONS 19.2

1. GMP stands for.....
2. HACCP means.....

19.3 FOOD QUALITY INSPECTION

Food quality inspection, as defined by the International Organization for Standardization (ISO), involves measuring, examining, and testing one or more characteristics of a food product and comparing the results against specific requirements to determine whether they meet the required standards.

19.3.1 Objectives of Food Quality Inspection

- To separate poor quality products from good quality products
- To increase the reputation by protecting customers from receiving poor quality products

Food Processing and
Value Addition

Notes

- To ensure that the quality policy is followed
- Successful inspection helps in timely delivery of products
- To earn a reputation in the market

19.3.2 Stages of Inspection

- Inspection of incoming raw materials
- Inspection of production process
- Inspection of finished goods

19.3.3 Drawbacks of Inspection

- Inspection adds to the cost of the product without adding value.
- It is partially subjective; the inspector often has to judge whether a product passes or not.
- Inspection merely separates good and bad items; it does not prevent the production of bad items.

19.3.4 Difference between Food Inspection and Food Quality Control

Inspection assesses the manufacturing of non-conforming products and acts as a filter to remove them from the production flow (Reactive system).

Quality control attempts to prevent the manufacture of non-conforming products in the first place and attempts to predict, reduce, or eliminate the causes (Proactive system).

**INTEXT QUESTIONS 19.3**

1. Food inspection is a system, whereas quality control is a system.
2. The stages of food quality inspection are
3. ISO stands for.....

19.4 FOOD QUALITY CONTROL (QC)

It is the procedures that a company must follow to ensure that its products meet food quality regulations and acceptable standards, thus ensuring consumer safety.

Some of the other food quality control procedures include product standards, Critical Control Point (CCP) identification, label specifications, cleaning and sanitizing programs, recall programs, and warehousing and shipping.

19.4.1 Purpose

- Provide routine and consistent checks to ensure data integrity, correctness, and completeness
- Identify and address errors
- Document and record all quality control (QC) activities

Higher QC activities include technical reviews of source categories, activity and emission factor data, and methods.

19.4.2 Importance and Functions

Quality control ensures the production of high-quality products, which is immensely helpful in attracting more customers and increasing sales. It is significantly beneficial for maintaining existing demand and creating new demand for the company's products.

19.4.3 Difference between Quality Control and Quality Assurance

Quality Control (QC) is a system that verifies and maintains a desired level of quality in an individual test or process. On the other hand, Quality Assurance (QA) is a part of quality management that focuses on providing confidence that quality requirements will be fulfilled. Table 18.2 presents the main differences between QC and QA.

Table 19.2 Difference between quality control (QC) and quality assurance (QA)

QUALITY ASSURANCE	QUALITY CONTROL
A medium to long-term process; cannot be implemented quickly	Can be implemented at short notice.
Focus on processes- how things are made or delivered	Focus on outputs- work-in progress and finished goods.



Notes

Food Processing and
Value Addition

Notes

Achieved by improving production processes	Achieved by sampling & checking (inspection)
Targeted at the whole organization	Targeted at production activities
Quality is built into the product	Defected products are inspected out



INTEXT QUESTIONS 19.4

1. QA stands for
2. QC stands for
3. Quality control is a long-term process (True/False).

19.5 FOOD SAFETY

19.5.1 Definition

Food safety refers to the practices observed during the handling, processing, and distribution of food to ensure that contaminants that can cause foodborne illnesses are not present. Food safety is an important aspect of food production and handling as it protects the health and safety of consumers from any food-related issues.

19.5.2 Food Safety and Hazards

Knowledge of food safety is very important and can be improved by understanding 'toxicity' and 'hazard'. These two terms can be defined as follows:

- **Toxicity** is the ability of a substance to create harm under specific conditions.
- **Hazard** is an estimation that toxicity will happen if a substance is not used properly by following prescribed terms and conditions. Hazards are categorized into three types: physical, chemical, and biological. Each type of hazard can cause adverse effects on the health of consumers.
 - a) **Physical hazard** is any physical material not typically found in food that can cause harm to consumers' health.

Sources of physical hazards

- ❖ Materials from the field like stones, insects, wood, insects etc.

- ❖ Materials arising from handling and food processing operations such as bones, metal, wood, bolts, glass, wire etc.
 - ❖ Materials entering food products during distribution like metal, insects etc.
 - ❖ Materials intentionally placed in food by employees.
- b) **Chemical hazards** are chemicals or unwanted substances added intentionally or unintentionally to foods. Examples include pesticides, several additives, chemical residues, toxic metals, etc.
- c) **Biological hazards** are living organisms and include microorganisms associated with food, which cause diseases known as foodborne pathogens. There are two types of foodborne diseases caused by pathogens i.e., food infection and food poisoning.

*Notes*

The various food safety hazards are presented in Fig. 19.1.



Fig. 19.1: Various Food Safety hazards

19.5.3 Food Infection

Food infection is caused by the ingestion of a sufficient number of microorganisms of public health significance, resulting in illness. Examples of food infections include salmonellosis and listeriosis.

Food Processing and
Value Addition

Notes

19.5.4 Food Intoxication

Food intoxication is caused by the ingestion of bacterial toxins. Examples of food intoxications include staphylococcal poisoning and botulism.

Among the various hazards, biological hazards are of significant concern in the context of foodborne illness. It is important to understand several key terms related to food safety, including contamination and adulteration.

19.5.5 Contamination

Contamination refers to the presence of harmful or objectionable substances in food items, such as microorganisms or chemicals, before, during, or after processing and storage. Major sources of food contamination include water, air, dust, equipment, sewage, insects, rodents, and employees.

19.5.6 Adulteration

Adulteration refers to the addition of inferior substances to food or the lowering of food quality by extracting valuable ingredients. Adulteration can be intentional or unintentional and may occur during processing, storage, transportation, and distribution of food.

19.5.7 Adulterants

Adulterants are substances that are added to make food products unsafe and unfit for human consumption. These adulterants can be present in all food products we consume daily, including dairy products, cereals, pulses, grains, meat, vegetables, fruits, oils, and beverages. Some common adulterants found in food products are presented in Table 19.3.

Table 19.3 Common adulterants in Foods

S. No.	Food Products	Adulterant
1.	Cereal grains	Dust, pebbles, stones, straw, weed seeds, damaged grain, etc.
2.	Sugar	Chalk powder, washing soda, urea, etc.
3.	Milk and curd	Water and starch powder

4.	Coffee powder	Chicory, tamarind seeds powder
5.	Pepper	Dried papaya seeds and blackberries
6.	Mustard seeds	Argemone seeds
7.	Edible Oils	Mineral oil, karanja oil, castor oil and artificial colours
8.	Tea	Artificial colouring agents
9.	Pulses	Dyes, chemical and lead chromate
10.	Ghee, cheese and butter	Mashed potatoes, vanaspati and starch powder

*Notes***INTEXT QUESTIONS 19.5**

- Types of hazards are, and
- Presence of stone or wood in food material is an example of
 - Chemical hazard
 - Physical hazard
 - Biological hazard
 - None of these
- Presence of a sufficient number of microorganisms in food may cause food infection (True/False).

**ACTIVITY 19.1**

Visit local shops and collect various food materials – both raw and cooked. Examine the foods for the presence of adulterants.

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19.6 FOOD SAFETY MANAGEMENT PRACTICES (FSMS)

Food safety has become a major issue throughout the entire supply chain in the food industry. Therefore, food manufacturers should take all preventive measures to eliminate

Food Processing and
Value Addition

Notes

harmful substances from food. Government laboratories use analytical techniques to analyze food and detect toxic substances, as well as to ensure that the food is safe for consumers.

In addition to ensuring safe and healthy food for consumers, product manufacturers and service industries have realized that competition in a global market requires a continual and committed effort towards improving product and service quality. Therefore, they follow the process improvement cycle (PDCA), which comprises:

- a) PLAN (plan improvement)
- b) DO (implement plan for improvement)
- c) CHECK (analyze the collected data)
- d) ACT (take action)

A food hazard can enter food products at any stage of the food chain; therefore, proper control throughout the food chain is essential. Food safety and quality in food products can be ensured by following practices such as:

- Good Manufacturing Practices (GMP)
- Good Handling Practices (GHP)
- Hazard Analysis Critical Control Points (HACCP)

19.6.1 Good Manufacturing Practices (GMP)

GMP is an important tool that enables the reduction of food contamination and false labeling practices, thereby protecting consumers in all aspects of the food industry. Good Manufacturing Practices (GMPs) are the minimum sanitary and processing requirements necessary to ensure the production of wholesome food. GMPs are broad and general in nature, but their implementation results in safe and high-quality food.

Foundation of GMP

GMP is based on two components: effective manufacturing operations and effective food control operations.

Preliminary process in GMP

A manufacturing organization adopting GMP principles can:

- Consistently meet its own and customers' requirements.

- Meet industry standards and codes of practice.
- Comply with regulatory requirements.

GMP Activities

GMP is intended to build quality into the product at all stages of the operation. Good manufacturing practices are usually written for each of the following areas:

- Personnel
- Buildings and facilities
- Equipment and utensils
- Production and process control
- Records and reports
- Defect action levels and others

Benefits of GMP

GMP is a dynamic program that enables the organization to make and maintain quality improvements. An effective GMP program can offer several benefits to the organization including:

- Creates awareness of food quality and safety among the staff.
- Increases confidence in product safety.
- Provides a starting point for the HACCP program.
- Provides international recognition.
- Prevents expensive failures.
- Reduces customer complaints.
- Improves profits.

19.6.2 Good Handling Practices (GHP)

GHP ensures that all individuals who handle food follow good hygiene practices. GHP represents a systematic approach from the farm to the store or consumer to identify hazards and outlines procedures to minimize the risk of food contamination. It covers various aspects of the food industry, including the food supply chain, sanitation facilities,

*Notes*

Food Processing and
Value Addition

Notes

workers' hygiene practices, pest control, and prevention of physical and chemical pollutants.

Purpose of GHP

The overall objective is to ensure that the food is safe for human consumption, by ensuring compliance with the basic hygiene and sanitary practices. These objectives include:

- Preventing illness caused by food consumption
- Assuring safe food for human consumption following certain principles
- Increasing the knowledge of food safety within the entire food supply chain by providing health education programs

Areas covered/examined under GHP

- Food production area
- Design and facilities in the production area
- Control of operation
- Maintenance and sanitation of plant
- Personal hygiene
- Transportation facilities
- Product information and consumer awareness
- Training for employees

19.6.3 Hazard Analysis Critical Control Point (HACCP)

HACCP is an approach to providing assurance about food safety. It involves the identification of hazards and the assessment of the likelihood of their occurrence at each step in the food chain. The HACCP system can be implemented at all stages of the food chain, from food production and preparation processes to packaging, distribution, etc.

Principles of HACCP

There are seven basic principles of HACCP.



- **Conduct a hazard analysis:** Plan to determine the food safety hazards and identify the preventive measures the plan can apply to control these hazards.
- **Identify critical control points:** A critical control point (CCP) is a point, step, or procedure in a food manufacturing process where control can be applied, and as a result, a food safety hazard can be prevented, eliminated, or reduced to an acceptable level.
- **Establish critical limits for each critical control point:** A critical limit is the maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce that hazard to an acceptable level.
- **Establish critical control point monitoring requirements:** Monitoring activities are necessary to ensure that the process is under control at each critical control point.
- **Establish corrective actions:** Corrective actions are necessary to ensure that no product is injurious to health.
- **Establish procedures for ensuring the HACCP system is working as intended:** Verification procedures may include activities such as review of HACCP plans, CCP records, critical limits and microbial sampling and analysis.
- **Establish record keeping procedures:** The HACCP regulation requires that all food processing plants maintain certain documents, including their hazard analysis and written HACCP plan, and records documenting the monitoring of critical control points, critical limits, verification activities, and the handling of processing deviations.

Benefits of HACCP

HACCP provides a systemic approach to food safety. The benefits of HACCP include:

i. Benefits to Consumers

- ❖ Reduction in the risk of food borne diseases
- ❖ Increased confidence in the food supply
- ❖ Increased awareness of basic hygiene
- ❖ Increased quality of life

Food Processing and
Value Addition**Notes****ii. Benefits to Industry**

- ❖ Increased access to markets
- ❖ Reduction in food wastage
- ❖ Increased customer confidence

iii. Benefits to Government

- ❖ Improved public health
- ❖ Reduction in public health costs
- ❖ Enhancement of international trade
- ❖ Increased confidence of the community in the food supply

**INTEXT QUESTIONS 19.6**

1. GHP stands for
2. Identification of hazards, assessment of chances of their occurrence during each step in the food chain are important steps of
 - a. GMP
 - b. GHP
 - c. GSP
 - d. HACCP

19.7 CERTIFYING BODIES

India has a comprehensive system of product certifications governed by laws enacted by the Parliament of India. Key certifying bodies and standards include:

A. National Food Security Act (2013)

The Act aims to ensure food and nutritional security by providing access to adequate quantities of quality food at affordable prices.

Salient features

The major features of the Act are described below:

- ❖ The Act legally entitles up to 75% of the rural population and 50% of the urban population to receive subsidized foodgrains under the **Targeted Public Distribution System (TPDS)**.
- ❖ About two-thirds of the population is covered under the Act to receive highly subsidized foodgrains.

B. FSSAI (Food Safety and Standards Authority of India)

FSSAI is a government agency under the Ministry of Health and Family Welfare. It was established by the Food Safety and Standards Act of 2006 to supervise the activities and operations of food enterprises. It plays a crucial role in promoting public health by monitoring and regulating food-related activities. To ensure safety, all food distributors, processors, storage facilities, and retailers are required to obtain an FSSAI license.

FSSAI uses scientifically determined criteria to regulate a wide range of food products. It is responsible for setting hygienic standards for food manufacturing, storage, distribution, and warehousing. Furthermore, FSSAI aims to raise awareness among consumers about these standards to ensure their safety.

Basic principle

The Food Safety and Standards Act, 2006 defines food safety as the ‘assurance that food is acceptable for human consumption according to its intended use’. Food safety ensures that the food is safe for human consumption and involves the proper handling, preparation, and storage of food to prevent food-borne illnesses.

Salient Features and Functions

- ❖ Promote general awareness about food safety and food standards.
- ❖ Frame regulations to establish standards and guidelines for food products.
- ❖ Provide scientific advice and technical support to the Central and State Governments on food safety policy.
- ❖ Establish procedures and guidelines for laboratory accreditation and notification of accredited laboratories.

*Notes*

Food Processing and
Value Addition

Notes

- ❖ Collect data on food consumption, incidence and prevalence of biological risks, contaminants in food products, and identification of emerging risks.
- ❖ Create a nationwide information network to disseminate rapid information about food safety and related concerns to the public, consumers, and Panchayats.
- ❖ Provide training programs for individuals involved in or intending to start food businesses.

C. BIS

The Bureau of Indian Standards (BIS), formerly known as the Indian Standards Institute, is responsible for the development, maintenance, and application of standards for products, services, and processes in India. It verifies the quality and standard of products and issues a BIS certification mark. Legislation enacted in 1986 permits BIS to provide certification, and the BIS certification mark is mandatory for the sale of certain products in India.

Difference between ISI and FSSAI

ISI previously stood for Indian Standards Institute, but it has now been renamed to the Bureau of Indian Standards (BIS). Additionally, the mandatory certification mark is now referred to as the BIS certification mark rather than the ISI mark. BIS is responsible for the development, maintenance and application of standards for products, services, and processes in India. On the other hand, FSSAI is the authority responsible for setting guidelines for all food items manufactured and traded in India.

D. AGMARK

It is a certification mark used on agricultural products in India to ensure that they fulfil a set of requirements established by the Directorate of Marketing and Inspection, a government agency. Each product's grading criteria are determined using scientific methods. Samples of agricultural goods are collected from across the country, straight from the producing area, wholesale marketplaces, etc. These items are then tested in AGMARK Regional Laboratories. The standards are developed and framed based on the information gathered.

Objectives

- ❖ To provide customers with high-quality, hygienic food items
- ❖ To confirm the quality and purity of agricultural goods produced by local farmers

Benefits

- ❖ It increases the quality of crops.
- ❖ It stabilizes the prices of the crops.
- ❖ It facilitates peaceful resolution of market disputes.
- ❖ It makes interstate and international marketing more convenient.

E. ISO

ISO (International Organization for Standardization) standards are essential for improving food safety and hygiene in India and increasing the country's share in the global food trade. ISO has a series of international standards aimed at ensuring food safety throughout the supply chain. The ISO 22000 family addresses food safety management by providing guidelines and best practices for managing risks in all areas of food production.

ISO 9000 is an international reference for quality requirements, focuses on the "Quality Management" of an organization. Adoption of these standards is voluntary.

Key areas

Within its broad scope, the ISO 22000 family includes standards specific to catering, food manufacturing, farming, packaging, and animal foodstuffs and feed production.

Benefits

- ❖ It improves customer confidence in food safety.
- ❖ Demonstrates a commitment to supplying safe foods.

F. FPO

The Fruit Products Order Mark (FPO Mark) is a mandatory certification mark for all processed and packaged fruits in India. The Ministry of Food Processing

*Notes*

Food Processing and
Value Addition

Notes

Industries is the regulatory authority responsible for certifying and developing standards for the manufacturing of fruit products in India.

Products covered under FPO

- ❖ Synthetic beverages
- ❖ Vinegar
- ❖ Pickles
- ❖ Dehydrated fruits and vegetables
- ❖ Squashes
- ❖ Jam, jelly and marmalades
- ❖ Tomato products
- ❖ Preserved, candied and crystallised fruits
- ❖ Chutneys
- ❖ Canned and bottled fruits, juices, pulps and vegetables
- ❖ Frozen fruit and vegetables etc.

G. International Codex Alimentarius

The Codex Alimentarius Commission (CAC) is an international food standards body established jointly by the Food and Agriculture organization (FAO) and the World Health Organization (WHO) in May 1963. Its objective is to protect consumer health and ensure fair practices in food trade.

Purpose

The main purpose of this programme is to protect the health of consumers, ensure fair practices in the food trade, and promote coordination of all food standards work undertaken by international governmental and non-governmental organizations.

Difference between Codex and ISO

Codex	ISO
The Codex is a set of international standards recommended for regulating food safety in different countries.	ISO standards are voluntary guidelines that focus on improving food safety management systems.

**ACTIVITY 19.2**

Visit a nearby hotel and observe the following:

- The area where food is prepared and served.
- How the food is prepared and stored.
- How the food is served.
- The food service area
- Washing area
- All persons involved in handling the food from pre-preparation to service.

Comment on the cleanliness and hygiene and give suggestions for improvement.

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Labelling requirements

Food label in the context of food safety is most crucial as it directly communicates important information to the consumer. The most important food labelling requirements that holds special place regarding food safety include:

- Name of the food
- List of ingredients in descending order
- Nutritional information
- Declaration regarding food (vegetarian or non-vegetarian)

*Notes*

Food Processing and
Value Addition



Notes

- Declaration regarding food additives
- Name and complete address of the manufacturer or packer
- FSSAI logo and license number
- Net content by weight or volume
- Retail sale price
- Consumer care details
- Lot/Code/Batch identification
- Date Marking – “Date of manufacture or packaging” and Expiry/Use by and manner of declaration of date of manufacturer or expiry/use by
- Labelling of imported foods
- Country of origin for imported products
- Instructions for use
- Declaration regarding food allergens
- Symbol for food materials not meant for human consumption



INTEXT QUESTIONS 19.7

1. mark is a mandatory for all processed fruit products in India.
2. FSSAI stands for
3. Codex Alimentarius Commission is jointly formed by
 - a. WHO & United Nations
 - b. FAO & United Nations
 - c. WHO & FAO
 - d. United Nations & UNDP

**WHAT YOU HAVE LEARNT**

- Every food product has characteristics and indices that can be measured using sensory, physical-chemical, or microbiological methods.
- Quality of foods may be defined as the blend of those characteristics that differentiate individual units of a product and have significance in determining the degree of acceptability.
- Quality control refers to the standards that maintain the quality of food products according to the customer acceptability.
- According to ISO, inspection of food quality is defined as an activity of measuring, examining, testing one or more characteristics of a food product and comparing the results with specific requirements to determine whether conformity is achieved for each characteristic.
- Quality Control (QC) is a system of routine technical activities used to measure and control the quality of the food production process.
- Quality Assurance (QA) involves a planned system of review procedures conducted by personnel not directly involved in the food production process.
- Food safety means assuring the acceptability of food for human consumption.

**TERMINAL QUESTIONS**

1. What are the different factors determining food quality?
2. What are pigments? Give examples.
3. Explain the different types of microbes responsible for food borne-illness.
4. Define food quality control. Why is it important?
5. What is PDCA approach?
6. What are the objectives of food quality inspection?
7. What is the difference between food inspection and food quality control?
8. What are the differences between QA and QC?
9. What is the importance of food safety?
10. What is a hazard? How is it linked with food safety?

*Notes*

Food Processing and
Value Addition

Notes

11. Explain the different types of hazards.
12. What is food adulteration? Give some examples.
13. What is the difference between GHP and GMP?
14. What is HACCP?
15. Explain the different principles of HACCP.
16. Discuss ISO and FSSAI.
17. What is the importance of FPO and BIS?

**ANSWERS TO INTEXT QUESTIONS****19.1**

1. Degree of excellence, a high standard, or value.
2. Appearance, color etc.
3. Intensity, wavelength.
4. The amount of free radicals that can cause an off-odor or off-flavor in foods.
5. Acid, base
6. Pigments
7. Spherical, spiral and rod
8. Viruses

19.2

1. Good Manufacturing Practices
2. Hazard Analysis Critical Control Point

19.3

1. Reactive, proactive
2. Inspection of raw material, inspection of production process and inspection of finish goods.
3. International Organisation for Standardization

**19.4**

1. Quality assurance
2. Quality control
3. False

19.5

1. Physical, chemical and biological
2. Physical hazard (option b)
3. True

19.6

1. Good Handling Practices
2. HACCP (option d)

19.7

1. Fruit Product Order
2. Food Safety and Standards Authority of India
3. WHO & FAO (option c)

GLOSSARY

Food quality control: It is the process of monitoring and maintaining food quality according to set guidelines to ensure that consumers receive safe and secure food.

Food contamination: The presence of harmful or objectionable substances in food items, such as microorganisms or chemicals, before, during, or after processing and storage is termed as food contamination.

Food adulteration: It is the addition of inferior substances to food or the lowering of food quality by extracting valuable ingredients.

Toxicity: The ability of a substance to cause harm under specific conditions.

Hazard: It is potential of a substance to cause toxicity. All toxic substances are hazardous, but not all hazardous substances are toxic.

GMP: Good Manufacturing Practices (GMPs) are the minimum sanitary and processing requirements necessary to ensure the production of wholesome food.

Food Processing and
Value Addition

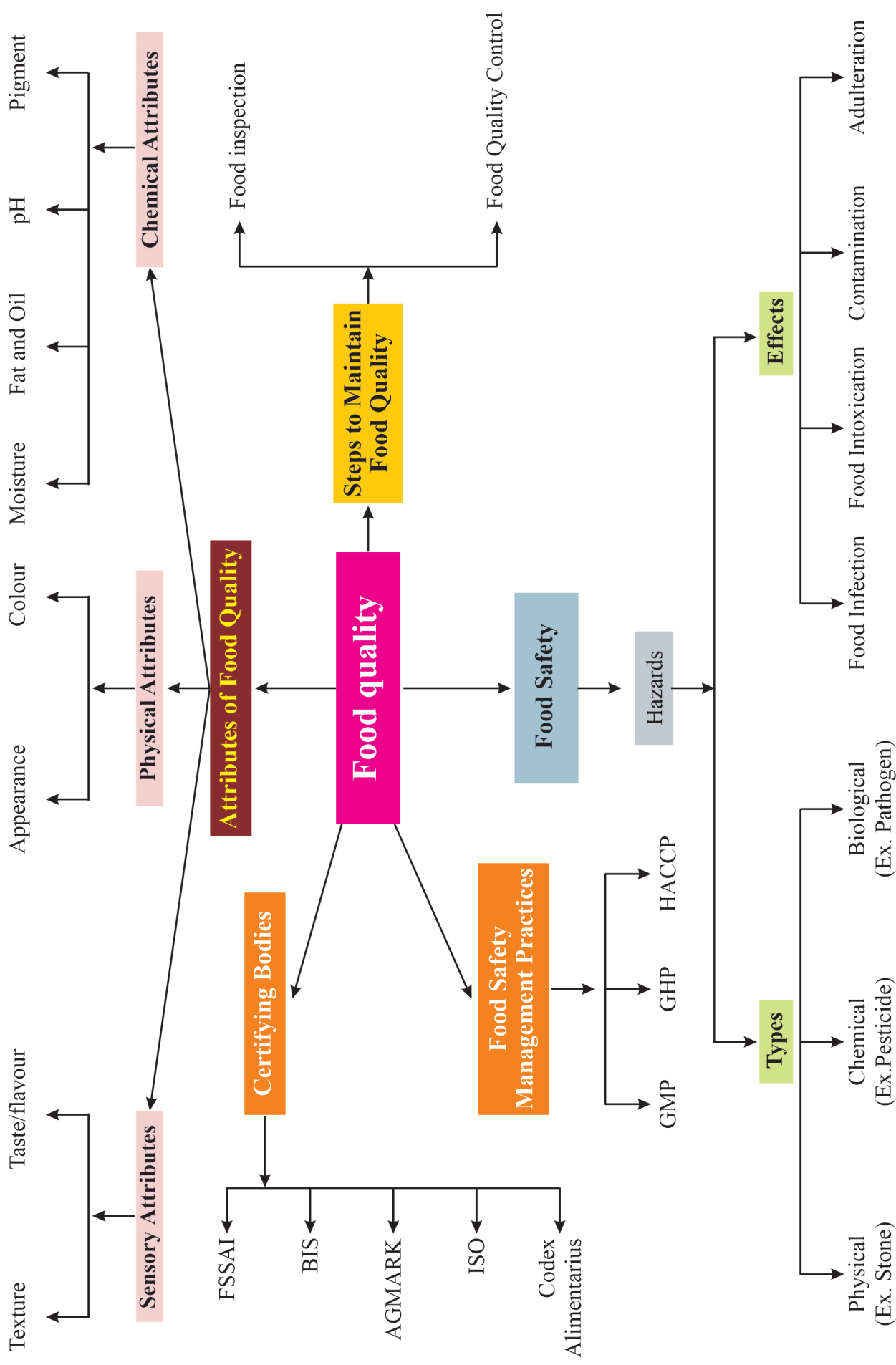
Notes

GHP: Good Handling Practices (GHPs) ensures that all individuals who handle food follow good hygiene practices.

SUGGESTED READINGS

1. *Food Safety and Quality*, TNAU Agritech Portal, Tamil Nadu Agricultural University, Coimbatore.
(<http://www.agritech.tnau.ac.in>)
2. *General Principles of Food Hygiene*, Food and Agriculture Organization, Rome, Italy.
3. *Principles of Food Safety and Quality Management*, eGyanKosh, Indira Gandhi National Open University, New Delhi.

WHAT YOU HAVE LEARNT



MODULE - 5

Agricultural economics, marketing and policy

- 20. Basics of Agricultural Economics
- 21. Agricultural Marketing and Policy
- 22. Agricultural Finance and Credit in India