Baking Technician

(Job Role)

Qualification Pack: FIC/Q5005
Sector: Food Processing

Modules for Class X

PSS Central Institute of Vocational Education (NCERT) Shyamala Hills, Bhopal, Madhya Pradesh

First Edition

August, 2021

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FOREWORD

The National Curriculum Framework–2005 (NCF–2005) recommends bringing work and education into the domain of the curricula, infusing it in all areas of learning while giving it an identity of its own at relevant stages. It explains that work transforms knowledge into experience and generates important personal and social values, such as self-reliance, creativity and cooperation. Through work, one learns to find one's place in society. It is an educational activity with an inherent potential for inclusion. Therefore, an experience of involvement in productive work in an educational setting will make one appreciate the worth of social life, and what is valued and appreciated in the society. Work involves interaction with material or other people (mostly both), thus, creating a deeper comprehension and increased practical knowledge of natural substances and social relationships.

Through work and education, school knowledge can be easily linked to learners' life outside the school. This also makes a departure from the legacy of bookish learning and bridges the gap between school, home, community and workplace. The NCF–2005 also emphasises Vocational Education and Training (VET) for all those children, who wish to acquire additional skills and/or seek livelihood through vocational education after either discontinuing or completing their school education. VET is expected to provide a 'preferred and dignified' choice rather than a terminal or 'last-resort' option.

As a follow-up of this, NCERT has attempted to infuse work across subject areas and also contributed in the development of the National Skill Qualification Framework (NSQF) for the country, which was notified on 27 December 2013. It is a quality assurance framework that organises all qualifications according to levels of knowledge, skills and attitude. These levels, graded from one to ten, are defined in terms of learning outcomes, which the learners must possess regardless of whether they are obtained through formal, non-formal or informal learning. The NSQF sets common principles and guidelines for a nationally recognised qualification system covering schools, vocational education and training institutions, technical education institutions, colleges and universities.

It is under this backdrop that Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), Bhopal, a constituent of NCERT, has developed learning outcomes based modular curricula for vocational subjects from Classes IX to XII. This has been developed under the Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education of the Ministry of Education, erstwhile Ministry of Human Resource Development.

This textbook takes care of generic skills embedded in various job roles in a comprehensive manner and also provides more opportunities and scope for students to engage with these common and necessary skills, such as communication, critical thinking and decision making in different situations pertaining to different job roles.

I acknowledge the contribution of the development team, reviewers and all institutions and organisations, which have supported in the development of this textbook.

The NCERT would welcome suggestions from students, teachers and parents, which would help us to further improve the quality of the material in subsequent editions.

Director
National Council of Educational Research and Training

New Delhi
August 2021

ABOUT THE TEXTBOOK

Indians learnt the art of baking from Europeans. Bakery products like paav, bread and biscuits have now become mass foods. Classical Indian baked products include mawa cake, nankhatai, rusk, bati, litti, chenna poda, etc. The bakery industry offers huge opportunities for growth, innovation and job generation. Changing consumer habits and lifestyle are shaping the bakery industry in India. Bakery industry contributes about 20 per cent of the total food processing sector and has thus, become a major sector contributing to Indian economy and employment. To meet the growing production levels, Bakery sector needs various categories of trained workforce such as Baking Technician.

A Baking Technician is involved in production of a variety of bakery products. They are also responsible for maintenance of equipment and work area of the bakery unit. The present textbook has been developed to impart practical knowledge and skills to young students desirous of pursuing a career in the field of bakery. A learner-centred approach has been adopted in the development of the textbook. The textbook has been developed with the collaboration of leading experts in the area of bakery sciences. The textbook has been further extensively reviewed by industry experts to ensure quality learning. Further, the textbook has been fully aligned with the National Occupational Standards (NOSs) for the job role of Baking Technician. The textbook helps the students to acquire necessary knowledge and skills as per the Qualification Pack (QP) for the job role of Baking Technician.

The following NOSs for the job role of 'Baking Technician' have been fully covered in the textbook:

FIC/N5018 Prepare for baking products in the oven

FIC/N5019 Bake bakery products in the oven

FIC/N5020 Complete documentation and record keeping related to baking products in the oven

FIC/N9001 Food safety, hygiene and sanitation for processing food products

The contents of the textbook have been divided into four modules. Module 1 discusses the various aspects relating to food quality and food safety. Food safety management systems and laws covering the area of food safety are also dealt in detail in the module.

Module 2 deals with maintenance of hygiene and sanitation in work area. The important safety practices along with proper disposal of waste is further covered in this module.

Module 3 covers the quality parameters of different raw materials, ovens, preparation of batter and dough and cooling, packaging and storing of different types of bakery products.

Module 4 describes the importance of documentation and record keeping in a bakery with various specimen formats of different types records.

I hope the textbook will prove useful for students aspiring a successful career in bakery. It is further hoped that the textbook will prove equally useful for teachers, working personnel in bakery sector as well as housewives and other enthusiasts. Suggestions for improving this textbook are always welcome.

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ACKNOWLEDGEMENTS

The National Council of Educational Research and Training expresses its gratitude to all members of the Project Approval Board (PAB) and officials of the Ministry of Education, Government of India, for their cooperation in the development of this textbook. We are grateful to the Director, NCERT for his support and guidance. Heartfelt acknowledgment goes to Joint Director, PSSCIVE for providing us opportunity to come upto his level of expectations. We are also thankful to officials of Food Industry Capacity and Skill Initiatives (FICSI) for their support.

The Council also extends its gratitude to all the expert contributors for sharing their expertise by responding to the requests for the development of this textbook. The Council acknowledges the contribution of the Review Committee members Chef Manoj Patekar and K. Sridevi for reviewing the textbook and providing valuable.

Special thanks to Ms. Preeti Dixit, Assistant Professor (contractual), Department of Agriculture and Animal Husbandry, PSS Central Institute of Vocational Education, Shyamla Hills, Bhopal for her support during the development of this book.

The Council acknowledges the untiring efforts of Jivan Koli and Jeetender Kumar for has computer related inputs in the Department of Agriculture and Animal Husbandry, PSS Central Institute of Vocational Education, Shyamla Hills, Bhopal.

Contribution of Programme and Monitoring office, Administration and Secretariat of PSSCIVE is also duly acknowledged.

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a [1]**[SOVERIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens:

JUSTICE, Social, economic and political;

LIBERTY to 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 [2][unity and integrity of the Nation];

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

1. Sub. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Sub. by the Constitution (Forty-second Amendment) Act, 1976, sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)

CONTENTS

Module 1 Food Safety Laws and Standards

INTRODUCTION

In this module, we will learn about shelf life of food factors affecting food quality along with measures for controlling food quality. We will also learn about laws and standards to ensure food safety.

SESSION 1: SHELF LIFE AND QUALITY CONTROL OF FOOD

Shelf Life of Food

Edible substances which provide nourishment to humans are called foods. Food is essential for growth, maintenance, and vital functions of our body. Nutrition through food supplies us energy, protein, carbohydrate, fats, vitamins and minerals. Food gets digested, absorbed and assimilated in the body to supply the essential nutrients. Food is obtained from two major sources:

i. Plant sources (e.g. wheat, rice, legumes, oilseeds, pulses, spices, fruits and vegetables etc.)
ii. Animal sources (e.g. milk, butter, paneer, cheese, curd, ghee, eggs, meat, fish etc.)

Some foods perish slowly whereas others perish rapidly due to their shelf life. That is why some foods are available throughout the year whereas some foods are available only during the specific seasons. Shelf life is the duration for which food is fit for human consumption. Shelf life of food is generally measured in days, month or years under certain storage conditions.

For example, the shelf life of an unrefrigerated egg is 7 to 10 days, and for refrigerated egg is about 30 to 45 days. Similarly, the shelf life of refrigerated whipped cream is 14 days and for frozen cream it is 3 months. Temperature and humidity affect shelf life of most of the foods.

Therefore, in food processing industry the term “shelf life” of the food is used to denote perishability of food.

Classification of foods on the basis of shelf life

Foods are classified into three following groups on the basis of their shelf life as shown in Fig.1.1.

Food Perishability

Non-Perishable Food	Semi-Perishable Food	Perishable Food
■ Stays good upto an year. ■ Sugar, Legumes, Oil, Pickle etc. ■ Store in a cool and dry Place.	■ Stays good for a week to few months. ■ Semolina, Gram flour. Onions, Potatoes, Apples, Frozen foods etc. ■ Store in a cool and dry Place.	■ Spoils within a couple of days. ■ Milk, Eggs, Meat, Fish Poultry and most Fruits / Vegetables - specially Green Leafy Vegetables.

Fig.1.1: Classification of foods on the basis of shelf life

Food Quality

Food quality represents the sum of all desirable characteristics of food which are acceptable to consumers. External characteristics include appearance, texture, colour and flavour. Internal characteristics of food quality are its chemical, physical and microbial properties. The different parameters which determine the food quality are shown in Fig.1.2.

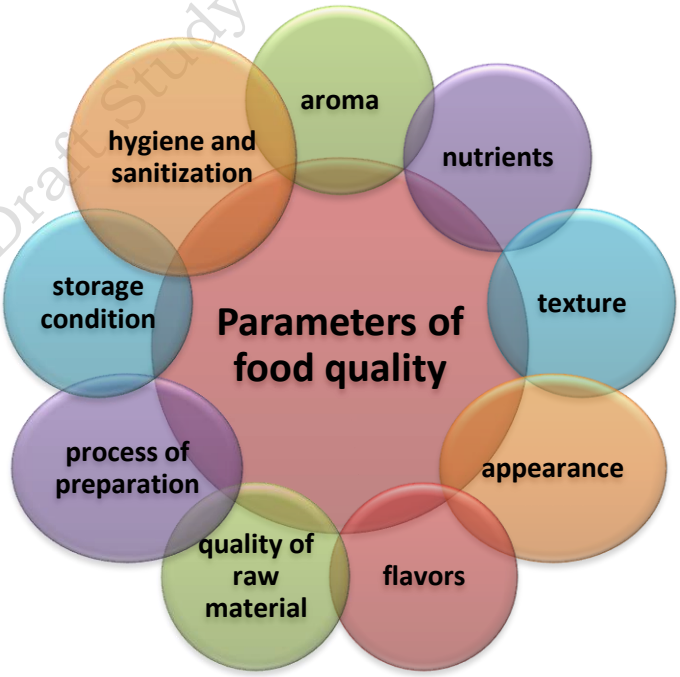

Fig.1.2: Parameters of food quality

Food Quality Control

Food quality control is the most important measure required to prevent contamination and spoilage of food. Quality is the ultimate criterion of the desirability of any food product.

The overall quality of a food depends on the nutritional, physical, chemical and sensory quality. The absence of the nutritional qualities and possible presence of food toxins and chemical additives will affect the quality of food which in turn may harm the consumer. Therefore, quality control in food becomes very important.

Food quality control has the following purpose:

1. To protect the consumers from dangers of contaminated food.
2. To ensure that consumer get the right quantity and quality of food.
3. To prevent damage of any equipment due to adulterants or physical impurities present in ingredients.
4. To bring maximum efficiency in food processing by achieving the maximum yield.
5. To ensure the implementation of food laws and food safety standards.
6. To produce a defect free product than rectifying or replacing the product.
7. To prevent loss of goodwill and revenue.

Food Quality Control Measures

Food Quality Control is a rigorous cycle of inspection and implementation of food safety system and practices. Food quality control eliminates the threats in every stage of food production and result in high quality, safe, hygienic healthy and nutritious food to the consumers.

Following measures help in ensuring the quality of food:

Defining product standards

Standard product specifications help in achieving the quality of the desired finished product. It is adjudged on the basis of physical, nutritional and microbiological characteristics of the product. An example is shown in Table 1.1.

Table 1.1: Example of product purchase specification

Bakery Date of formulation Recipe no.		Recipe name: Vanilla Cookie Prepared by: Approved by:	
Product standard specification			
S. N.	**Physical characteristics**	**Nutritional profile/100 g**	**Microbiological characteristics**
1	Color: Golden brown	Protein : 6 gms	Free from any contamination

2	Texture: crispy	Carbohydrates: 40 gms	Shelf life
3	Shape: round	Fat : 40 gms	Allergens
	Size: 1inches diameter	Vitamins: traces	
	Net weight: 22 gm	Fibre : 2 gm	

Ingredient specifications

The specification of the ingredients plays important role in the quality and consistency of the final food product. It is done through standard purchase specification (SPS) document as shown as an example in Table 1.2.

Table 1.2: Sample standard purchase specification (SPS) for vanilla cookie

Bakery **Date of formulation** **Recipe no.**						**Recipe name: Vanilla Cookie** **Prepared by:** **Approved by:**			
Standard Purchase Specifications									
S. N.	Ingredients	Image	Brand	Standard weight	Standard size	Color	Shelf life	Nutritional profile	Cost
1	Refined wheat flour		XYZ co.	25 kg bag	-	Unbleached, white	3 months	Protein content 6-8 %	Rs. 29 /kg
2	Butter		PQR co.	1 kg block	4 inches x 6 inches	Pale yellow	Minimum6 months	Unsalted Fat content 80 %	Rs. 400/ kg
3	Castor Sugar		ABC Co.	1 kg packets	0.1 mm size of granule	White	Minimum6 months	Sulphur free	

Approved supplier

The approved and authorised suppliers are reliable as they supply the raw material as per the standard purchase specification. They also ensure the continuous supply of raw material as per the agreement between supplier and the firm. An example is given in Table 1.3.

Table 1.3: Sample list of approved supplier

Bakery Approved by:				
List of approved suppliers				
S. No.	Name of the product	Name of the supplier	Agreement valid till	Address of the supplier
1	Refined flour	ABC Co.	April 2021	.....
2	Sugar	BDC. Co	March 2021	.....

Product formulation

The process of food production is documented in written format also known as "formula" or a "standard recipe". This process will help in maintaining consistent quality and quantity of final product. An example for product formulation recipe sheet is provided in Table 1.4.

Table 1.4: Recipe sheet for vanilla cookie

Recipe Sheet for "Vanilla cookie"			
Recipe Name: Vanilla cookie Weight per packet**:** 250 gm Weight per piece: each 25 g Yield : 10 cookies Baking Time: 20 minutes Baking Temperature: 160^{o} C			
Qty	**Unit**	**Ingredients**	**Method of Preparation**
1	Kg	Flour	1- Cream the butter and sugar. 2- Add the flour to make homogenous dough. 3- Make balls of 25 gms each. 4- Place on a baking tray with a distance of 01 inches between each cookie. 5- Bake in pre- heated oven for 20 minutes. 6- Cool in a cooling chamber for further processing.
400	g	Castor Sugar	
500	g	Butter	
1.9	KG	**Total Weight**	

Microbiological standards

If any traces of microorganisms beyond the safe limits are found in food during production, post-production and storage, they are rejected immediately. For example, molds developing on bread.

Manufacturing procedures

By following the documented manufacturing procedure of preparing bakery product, producer maintains the quality and standard of the product in every lot.

Critical Control Points

It is very important to have a check on critical control points as even very small mistakes can create physical, chemical or biological changes in the finished product which may lead to health hazards or the loss of product quality. For example, if the vanilla cookies are baked at wrong temperature the cookies will be under-cooked or burnt because the temperature is a critical control point.

Laboratory analysis

This process is a part of quality control program and performed after the production of the food. Samples of the prepared bakery product are collected

and sent for laboratory analysis. On the basis of the product analysis, the results are drawn which describe the quality of the produced bakery product.

Packaging and labelling

Packaging is the promotional non-edible wrapper of the food material. It provides protection from any extraneous material and microorganism and prevention from cross contamination. Label is a document pasted or printed on the packaging material to provide detail about the manufacturing process, best before, ingredients, nutritional facts, allergens, and legal information which are directed by the government or authorities.

Good Manufacturing Practices

The term good manufacturing practices refer to procedure which minimises the possibility of contamination and cross contamination during the process of manufacturing, processing, packaging, storing, distribution or transportation.

In-process records

It is important to record the process of manufacturing. Both the production and quality control teams check the record and the processes to maintain the consistent quality of product.

Conclusion

Thus, in this session we have learnt about the shelf life of food, classification of foods on the basis of shelf life and various parameters of determining the food quality. The session concludes with various measures to maintain food quality.

What have you learned?

After completing this Session, you are able to:

- explain the shelf life of food
- classify foods on the basis of their shelf life
- examine food quality
- discuss food quality control measure

Practical Exercises

Activity

1. Classify and label given foods according to their shelf life/ perishability: Wheat, flour, rice, banana, milk, and onion, sugar, and spinach leaves.

2. Take 100 ml of milk in two glasses and store one glass in refrigerator and another glass at ambient temperature for 24 hours. After 24 hours, observe the changes occurred in each glass. Note down your observation and reason behind the changes happened with both samples

Check Your Progress

I. Multiple choice Questions

1. Food which are highly perishable can be stored for
   a. Long duration b. 2-3 months
   c. 1 year d. 2-3 days
2. Butter is an example of..... food
   a. animal b. plant
   c. high protein d. non-perishable
3. Texture, colour and flavour are used to judge:
   a. storage need of the food b. taste of food
   c. cooking time d. freshness of food
4. Following is covered under nutritional aspects of food
   a. microorganisms b. colour of food
   c. energy and protein d. appearance of food

II. Mark the statement TRUE or FALSE

1. Attributes or properties which describe a product.
2. Food provides energy, protein, fat and minerals.
3. Hygiene and sanitation are the most important parameter of food quality.
4. Packaging and labelling must be edible.
5. Food testing laboratories must be established before opening bakery.

III. Fill in the blanks

1. _____ is the duration in which food is fit for human consumption.
2. _____ and _____ are the two major sources from which food are obtained.
3. _____ helps to procure raw materials of similar quality volume and weight in every purchase cycle.
4. _____ is also known as formula of food production.

IV. Very short answer type questions

1. Why is quality control important?
2. List and explain any 5 parameters of food quality.
3. Draw the format of standard recipe.
4. What do you understand by in process records?

SESSION 2: FOOD SAFETY

In the past, many foods were processed at home. Advancement in technology and processing, larger per capita incomes and better purchasing power as well as increased consumer demand have led to a variety of products of processed foods, functional foods being manufactured. Safety of such foods needs to be assessed. This session also covers various types of hazards that keep on arising during various phases of food production and processing.

Food Safety

Safe food means the food which when consumed will not harm the consumers. Measures adopted for production, sale and consumption of safe food comes under food safety laws and standards.

Food becomes potentially harmful whenever it has been exposed to hazardous agents and intended use guidelines have not been followed. FSSAI is the apex organization for implementation of various rules and regulation regarding food safety.

Important Factors for Food Safety

Food safety means assurance that food will not cause any harm to the consumers. An understanding of food safety is improved by defining two other concepts - toxicity and hazard. Food safety and quality are important at the home level, but are critical in large scale food production and processing, and also where food is freshly prepared and served. Important factors for food safety are illustrated in Fig.1.3.

Fig. 1.3: Important factors for food safety

Food Safety Hazards

Hazard is anything with a potential to cause harm. Hazards can exist or enter in raw materials or introduced at any stage of the production.

Classification of hazards

Hazards can be broadly classified into following 5 categories as shown in Fig.1.4.

Fig.1.4: Categories of food safety hazards

Physical hazards

External objects like pieces or glass, nails, bolts, string, jewellery, small pieces of stone, that can cut the mouth, can cause choking, break teeth, can cause internal injury or burning if consumed. Various types of physical hazards are given in Fig. 1.5.

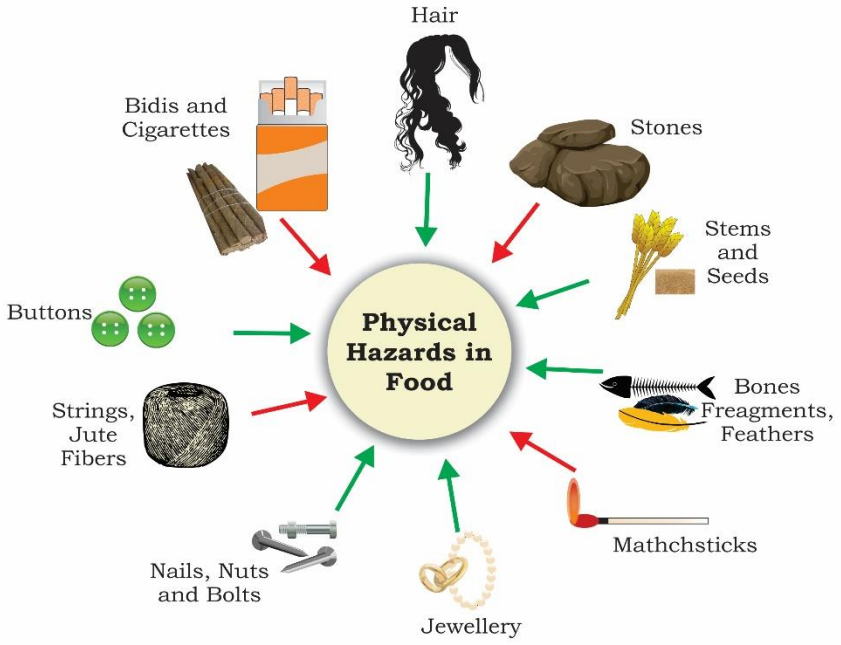

Fig. 1.5: Physical hazards in food

Biological hazards

The living organism such as weevil, fly, worm, cockroaches and microorganisms such as viruses bacteria, mold and parasite are hazardous and can cause illness if ingested with food. This type of hazard is known as biological hazard. These organisms are shown in Fig. 1.6 and 1.7.

Because food borne bacteria grow and multiply rapidly in "temperature danger zone". To avoid biological hazard, time and temperature control balance is essential. Therefore, to avoid such type of hazard food should either be stored below 5ºC or above 60ºC.

Danger temperature zone

The temperature range between 5^0C – 60^0C which is very suitable for growth of bacteria is termed as

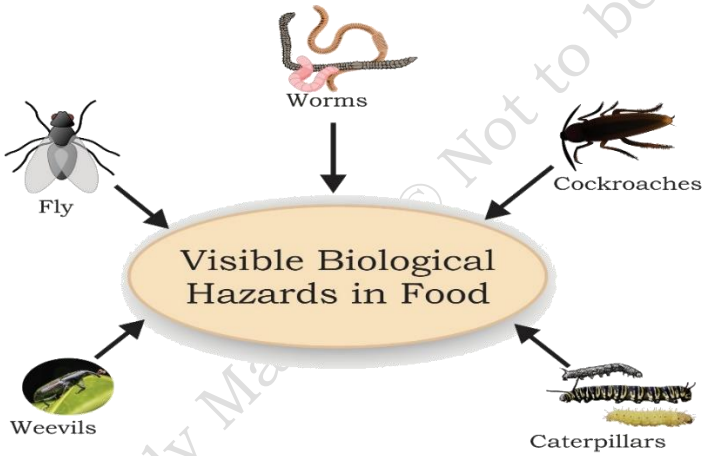

Fig. 1.6: Visible biological hazards

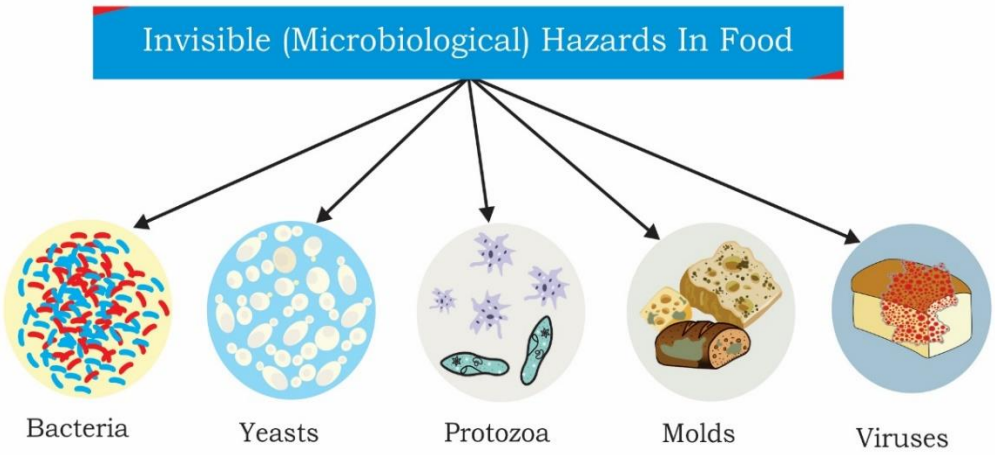

Fig. 1.7: Invisible biological hazards

Chemical hazards

Chemical contamination can happen at any stage in bakery production. Commonly used chemicals, when comes in contact with food can cause serious health disorders. When a food contains chemicals such as food additives, food colors or preservatives more than the permitted levels then the food becomes hazardous to human consumption.

Allergenic hazards

Certain specialised food groups and its constituents especially some proteins triggers immune reaction in the body upon ingestion. This causes the body to react in an unpleasant manner. This is called food allergy.

Food allergy

Immune system regularly protects the human body from the risk of hazards and infections to maintain good health. Food allergy is an abnormal response to a food triggered by the body's immune system. Even very small amount of allergy-causing food can raise the symptoms and sign of allergy.

Symptoms of food allergy

Food allergy may produce mild to severe symptoms. Most common symptoms of food allergy are shown in Fig. 1.7. Most severe condition due to food allergic reaction is anaphylaxis.

Anaphylaxis is a life-threatening whole-body allergic reaction which can cause difficulty breathing, acute low blood pressure and decrease in heart rate.

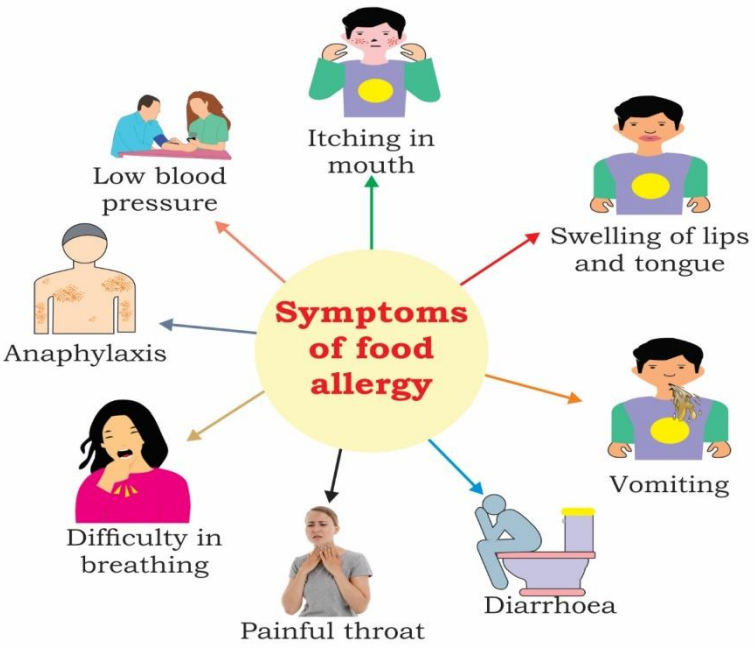

Fig. 1.7: Symptoms of food allergy

Food Allergens

More than 160 foods can cause food allergic reactions in people, but following eight are the most common allergenic foods (Fig. 1.8). Approximately 90 percent of food allergic reactions are caused due to the following 8 types of allergic food in direct form or as ingredient in the food products:

Fig. 1.8: Most common food allergen

Food Adulteration

Food adulteration is undesirable practice by which, the quality or the nature of a given food is reduced through addition of a foreign material (water in milk), inferior substance (chalk powder in flour, papaya seeds in pepper) and removal of vital element (removal of oil from almond seeds). Some of the instances of adulteration are shown in Table 1.5.
The foreign or inferior substance added to food is known as 'adulterant'.

Types of adulteration

Intentional adulteration

Substances intentionally added to increase the weight of the food product with inferior quality ingredients. Customer pays the original price for a substance which is mixed with sub-standard and harmful substances. Example: chalk powder in flour, water in milk etc.

Unintentional adulterants

This adulteration is not intentional in nature but accidental like adulteration from pesticides. For example, unnoticed adulteration by pests and rodents' excreta, bodily secretions and spoilage through micro-organisms. Metallic adulteration can also be incidental in nature.

Reasons for adulteration

- Increasing the weight of the substance by adding adulterants for profit
- To increase volume of trade by showing lower prices
- When demand is high and supply is low
- To cut down the product cost to increase affordability
- Lack of controlling and monitoring systems to check the practice of adulteration.

How to control adulteration

1. By forming strict rules and penalties if caught selling adulterated food substances.
2. By increasing awareness about the ill effects of adulteration.
3. By standardising process of certification and selling.
4. Stringent monitoring of the implementation.
5. By taking regular feedback from the industry to understand their concerns.
6. Frequent and random testing of most vulnerable and high-volume items.
7. Buying from regulated and reputed vendors only.

Table 1.5: Some instances of adulteration in bakery ingredients

S. N.	Name of product	Adulterant	Method of detection
1.	Milk	Water	The presence of water can be traced by putting a drop of milk on a polished slanting surface. The drop of pure milk flows slowly leaving a white trail behind it, whereas milk adulterated with water will flow immediately without leaving a mark.
2.	Ghee/Butter	Vanaspati or Margarine	Take one tea spoon of melted ghee with equal quantity of concentrated Hydrochloric acid in a stoppered test tube. Add pinch of sugar in it. Shake for one minute and let it rest for five minutes. Appearance of crimson color reflects adulteration of ghee with vanaspati or margarine.
3.	Refined wheat flour	Cheap flour, chalk powder	When dough is prepared from resultant or left out flour, more water has to be used. The normal taste of chapattis prepared out of wheat is somewhat sweetish whereas those prepared out of adulterated wheat will taste insipid.
4.	Whole spices	Dirt, dust, straw, insect, damaged seeds, other seeds	These can be examined visually or by sortex machine.
5.	Sugar	Chalk Powder, dust, sand	Dissolve 10-gram sugar in water. If sugar is adulterated then the adulterant will settle down at the bottom.

Conclusion

In this session you have learnt that food safety hazards must be identified and controlled or removed to ensure the consumer safety through food safety management. Various types of hazards are discussed in this session along with food adulteration and allergy. A detailed discussion of the food safety management systems is discussed in the next session.

What have you learned?

After completing this Session, you are able to:

- describe food safety
- classify and explain types of food hazards

Practical Exercises

Activity

1. Identify and categorize food safety hazards in your food laboratory and surrounding. Suggest the measures for removal of these hazards.
2. Take sample of milk, sugar and refined wheat flour and test them for adulteration.

Check Your Progress

I. Multiple choice Questions

1. If the food, does not cause any harm, it is considered
   a. **safe food** b. good food
   c. perishable food d. pure food
2. Food safety is improved by covering the concept of toxicity and …
   a. preparation b. **hazards**
   c. manufacturing d. storage
3. Following is considered as biological hazards in food safety:
   a. nails, bolts, b. food enzymes
   c. weevils, fly, worms d. allergens
4. Abnormal response by the body's immune system to a food mostly involves
   a. fat b. **protein**
   c. carbohydrate d. vitamins
5. Life threatening situation caused due to food allergy is called
   a. diarrhoea b. Phylaxis
   c. low blood pressure d. Anaphylaxis

II. Mark the statement TRUE or FALSE

1. Exposure of food to hazardous agents does not affect the food.
2. Food safety prevent the occurrence of toxicity.

3. Pesticides are physical hazards.
4. Danger temperature zone is suitable for bacterial growth.
5. Additives beyond permissible levels are considered physical hazards of food safety.
6. Adulterant increases the nutritional value of food.

III. Fill in the blanks

1. _____ and wheat are example of food allergens.
2. When inferior quality substance is added in the product to increase the profit, it is _____ type of adulteration.
3. Ideal temperature for storing food to prevent the growth of the microorganisms is below 5ºC or above _____ .
4. _____ and _____ are the example of physical hazards.
5. Living organisms such as fly, virus and bacteria are _____ type of hazards.

IV. Short answer type questions

1. List various aims and objectives of food safety.
2. Classify and explain food safety hazards.
3. List various types of allergens.

SESSION 3: FOOD SAFETY MANAGEMENT SYSTEMS

To detect and control the different types of food safety hazards we need to adopt a systemic approach towards it. To achieve this purpose various approaches for food safety management are taken up in this session. A food hazard can enter into the food at any stage of the food chain; therefore, adequate control throughout the food chain is essential.

Food safety and quality can be ensured through following approaches:

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

Hazard Analysis Critical Control Points (HACCP)

HACCP was developed in the year of 1950 by a team of food scientist and engineers. HACCP stands for Hazard Analysis and Critical Control Point. This is an internationally recognized system for the reduction of food safety hazards, risk and ensures food safety.

Under food safety management system, the potential hazards are identified and controlled at a specific point, by the quality control procedures described in HACCP. During the process of production, several biological, physical or chemicals changes occur.

It is very important to identify the areas where the concern of failure may be experienced and the principles of HACCP may be implemented, so that the possibility or threat of food safety hazard is eliminated.

Importance of HACCP

HACCP is an internationally recognized and preventive approach to reduce the risk of food hazards. HACCP identifies hazards at any stage of processing or manufacturing by taking appropriate action at the stage where the problem occurs. Thus, it contributes towards cultivation of a culture of food safety. Implementation of HACCP significantly reduces the costs of the enterprise by enabling producers, processors, distributors, and exporters to utilise. HACCP has seven principles which are given in Fig. 1.9.

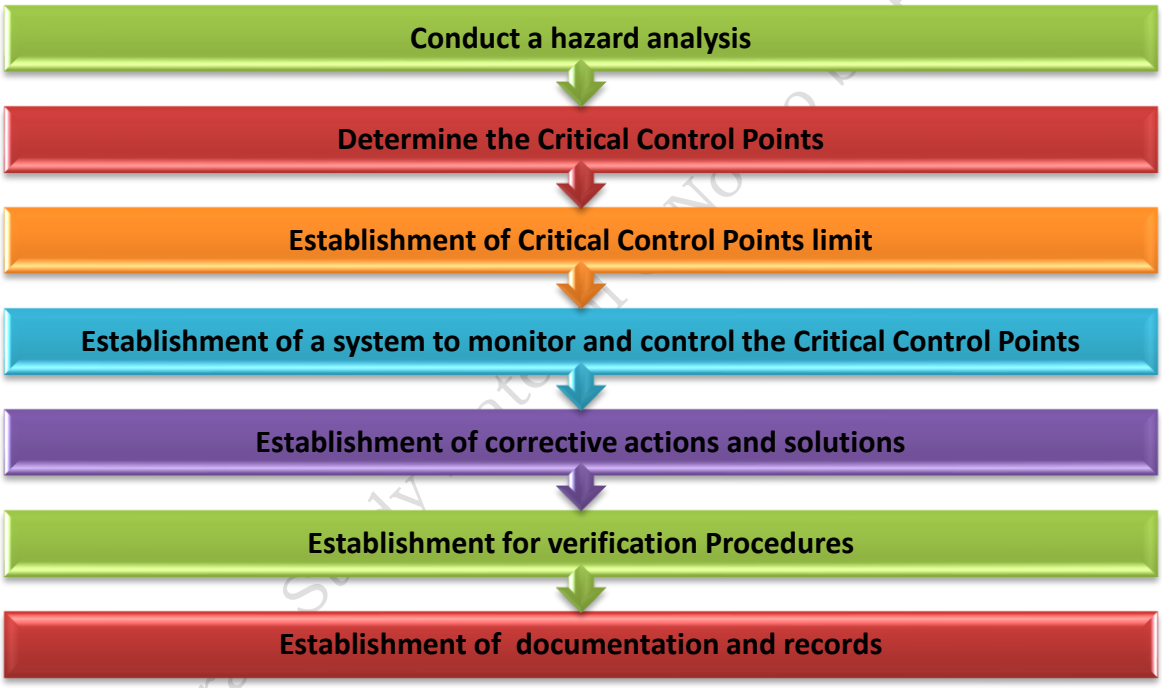

Fig.1.9: Seven principles of HACCP

The principles shown in above figure are discussed below in detail.

Conduct Hazard Analysis

What could go wrong? Identify the hazards that affect the process.

Decide which hazards are significant. Determine the measures necessary to control the hazard.

Critical Control Points

Most important points or steps, where the control measure must be used to prevent, eliminate or reduce the hazards to an acceptable level.

Critical limits

The third step involves setting up the limits for the deviation. These limits will separate acceptable standards from the unacceptable standards like cooking temperature limit, storage temperature limit, holding time limit.

Monitoring system

There is no point putting a system in place if it is not monitored. It will be a mere formality then. A monitoring system to ensure all CCPs are measured and ensured to be within critical limits is the next most important steep.

Corrective action

After the monitoring system is in place, the corrective system has to be put in place. What needs to be done when a breach is noticed? Should the food be discarded, or re heated? Should the raw material received to be returned back to the vendor.

Verification

Put internal checks in place by random sampling and audits to ensure the HACCP system is working. Do training wherever required.

Documentation

Last but not the least, document the entire process. Temperature charts, food receiving temperature charts, storage equipment, cleaning schedules, pest control charts, training data etc. is documented and maintained.

Good Manufacturing Practices (GMP)

Scope and meaning

Production of food in the best possible manner to ensure hazard free food in a manufacturing unit is called Good Manufacturing Practices.

Good Manufacturing Practice (GMP) is a system which ensures consistency, even quality and standards in bakery production. It helps to minimize all risks involved in the production that cannot be eliminated by testing the final product.

This covers all aspects of production like raw materials, premise, equipment, training and personal hygiene of staff. Each step must be monitored properly and documented so that the correct process are followed while production.

The 5 P's of GMP

GMP helps to ensure the consistent quality and safety of products by focusing attention on five key elements, which are often referred to as the 5 P's of GMP which are illustrated below in Fig 1.10:

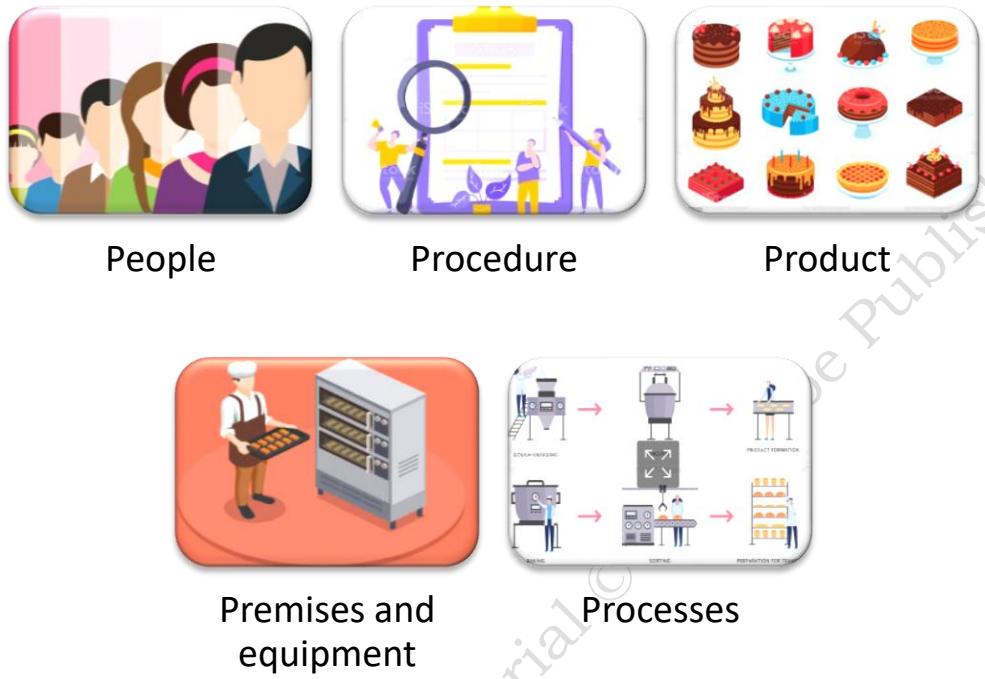

Fig. 1.10: The 5 P's of GMP

People

The most important part of the any production facility is people involved in the process of production who must be trained in Good manufacturing practices. If any discrepancies are observed in GMP performance, they must be immediately corrected and retrained.

Procedures

The assurance of manufacturing process and quality of the product manufactured are accountable and the procedures should be documented and recorded in all the prescribed procedures.

Products

Standard product specifications (SPS) are followed from the receiving of raw materials to final products presented to consumers. Hygienic handling of raw materials and finished product, proper cooling of baked items, proper packaging etc. is very important. Right from the stage of receiving the raw material till manufacturing and packaging the final product good manufacturing practices must be followed and documented.

Premises and Equipment

Premises and equipment where the manufacturers are answerable for the calibration of equipment's, proper and clean premises which prevent cross contamination, records of valid calibrated equipment's, cleaning procedures, conditions of the premises should maintained.

Processes

This refers to the continuous improvement applies to processes which are consistently evaluated. The manufacturer must keep the records which are provable to an auditor as well as available for self-inspection for facilitation of any possible improvements.

Benefits of GMP

Implementation of GMP in a bakery offers numerous benefits; some of the major benefits are shown in Fig. 1.11.

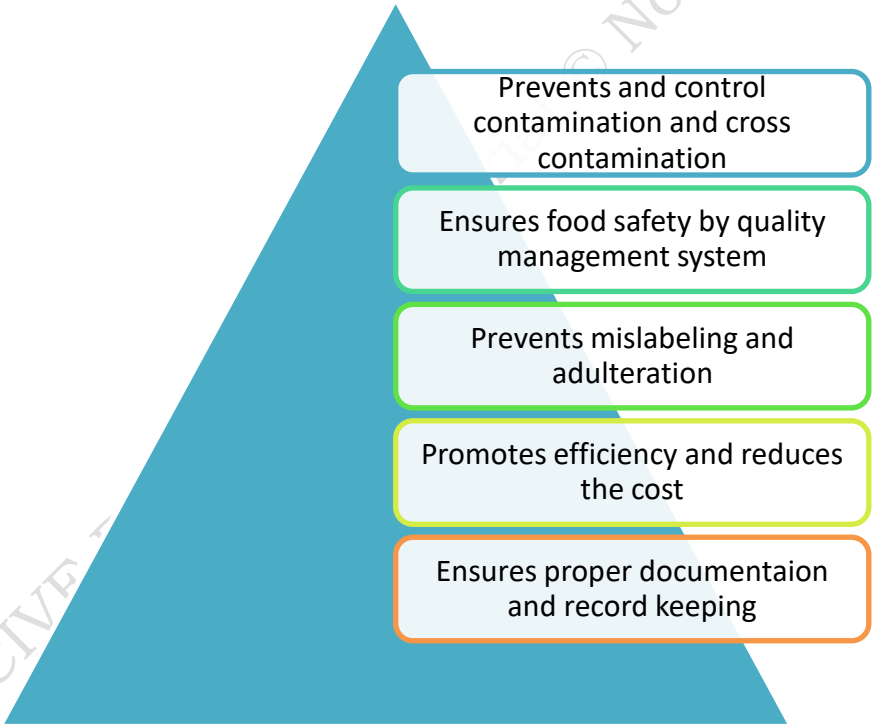

Fig. 1.11: Benefits of Good Manufacturing Practices

Key Principles of GMP

The GMP has the following seven key principles:

Writing a standard methodology in a step by step format

It involves preparation of Standard Operating Process of production in steps with as many details as possible in a proper formal format.

Following the SOP

Strict guidelines and constant supervision is done to ensure that the SOP is followed under all circumstances with zero tolerance for any deviation from the SOP.

Monitoring and documentation

Apart from a strict vigil on implementation, a lot of emphasis is laid on documentation of the process on a regular basis using checklists and audit formats.

Validation of equipment, systems and processes

Validation and auditing of all the processes, documents, and equipment is done to prove that the system is working efficiently.

Monitoring and maintaining facilities and equipment

For a consistent product and to avoid any lapse in the operation, maintaining the equipment and the facility is equally important. It costs less to maintain than to repair in case of a break down.

Controlling raw materials, components and product related processes

Quality checks at the time of receiving of the raw material, proper storage and handling of the ingredients is very crucial to the sanctity of the process.

Conducting planned and periodic audits

Last but not the least, external audits to confirm the efficiency of the system and to get an unbiased feedback for improvement is another important principle of the process.

Good Handling Practices (GHP)

Good Handling Practices (GHP) helps in identification of potential sources of risk and indicates what steps and procedures are taken to minimise the risk of contamination. It is a comprehensive approach followed from the farm to the store or consumer to ensure that all persons handling the food follow good hygiene practices.

Conclusion

For commercial bakery operations we need to identify and control the various hazards at the specific point during production chain. For this purpose, we have discussed the three approaches of Hazard Analysis Critical Control Points (HACCP), Good Manufacturing Practices (GMP) and Good Handling Practices (GHP) which are very effective and widely adopted in the food industry.

What have you learned?

After completing this Session, you are able to:

- describe food safety
- classify and explain types of food hazards
- discuss and follow food safety management system including HACCP, GMP and GHP

Practical Exercise

Activity

1. Visit a nearby bakery and observe the following:
   The area where bakery products are prepared and served
   How is the food prepared and stored?
   How is the food served?
   a) Comment if the outlet is following in some ways the approaches of HACCP, GMP and GHP or not.
   b) Identify the critical control points in the outlet and give suggestions for improvement in this area.

Check Your Progress

I. Multiple choice Questions

1. HACCP was developed in the year of……
   a. 1955 b. 1950
   c. 1946 d. 1959
2. Potential hazards are identified under which of the following system
   a. GMP b. HACCP
   c. GHP d. HAPCP
3. First step of HACCP is :
   a. hazard analysis b. determination of critical control point
   c. verification d. documentation
4. Various aspects of food production are covered under ….
   a. FSMS b. HACCP
   c. GMP d. GHP
5. GMP consist of
   a. 5 P's b. 5 C's
   c. 5 D's d. 4 G's

II. Mark the statement TRUE or FALSE:

1. HACCP is based on five principles.
2. Third step of HACCP deals with setting the limits for various parameters.
3. GHP deals with all the aspects of production.
4. People, procedure, product, premises and publicity are the 5 P's of GMP.

5. Following good hygiene practices by all food handler from farm to consumer is ensured through GHP.

III. Fill in the blanks

1. A food hazard can enter into the food at any stage of the _____.
2. Three approaches to ensure food safety and quality are_____, GMP and GHP.
3. _____ are the limits which are set for the deviation and separate acceptable standards from unacceptable standards.
4. GMP is based on _____ key principles.
5. five P's in GMP are People, procedure, product, premises, equipment and _____.

IV. Short answer type questions

1. Discuss food safety management system.
2. Explain various approaches of Food safety and quality.
3. Explain the importance of HACCP in food safety.
4. List and explain 5 P's of GMP.

SESSION 4: FOOD SAFETY LAWS

The term "food safety laws" refers to the rules and regulations made by the government and authorised agencies to control and regulate the production, handling, and trade of the food.

Food Standards

"Food standards" are set of legislation defining certain criteria, such as composition, appearance, freshness, source, sanitation, maximal bacterial count, purity, maximum concentration of additives etc. which the food must possess to be suitable for distribution or for sale.

The various purposes of food standards are shown in Fig.1.12:

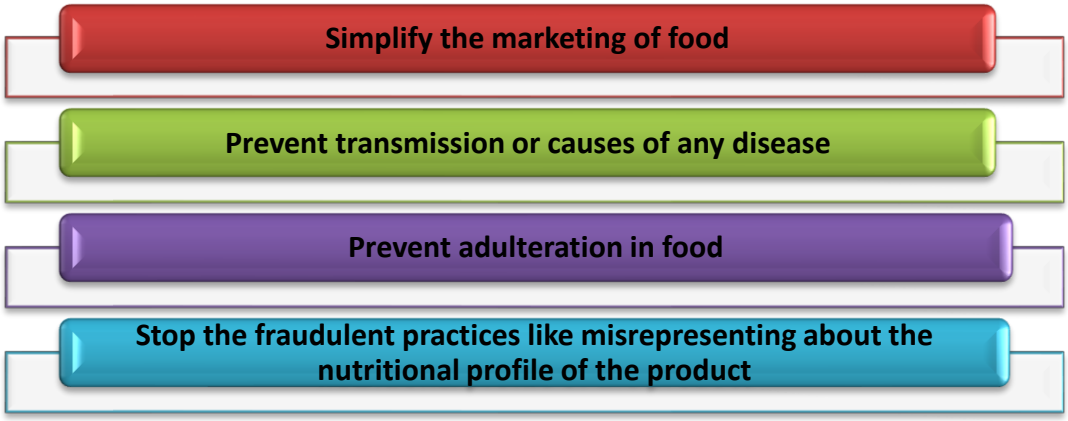

Fig. 1.12: Purposes of food standards

Food Standards in India

Food standards are required to integrate quality into every aspect of food handling, production and services. They provide a control system to ensure the hygienic supply of food and facilitate trade within and between nations. Food standards regulations in India were enacted and amended from time to time as per the need of the hour to ensure that food producers and sellers comply with the requirements of food safety. Major prevailing food standard regulations before 2006 are given in Table 1.6.

Table 1.6: Food legislation in India

S. No.	Legislation	Description
1.	Prevention of Food Adulteration Act 1954 (PFA, 1954)	Enacted to prevent adulteration of food. All food products manufactured in India, or imported and sold in India have to meet the requirements prescribed under this Act
2.	Fruit and Vegetable Product Order (1955)	Specifications for fruit and vegetable products are laid down.
3.	Meat Food Products Order (1973)	Processing of meat products is licensed under this order.
4.	Vegetable Oil Products Order (1998)	Specifications for Vanaspati, margarine and shortenings are laid down.
5.	Milk and Milk Products Order (1992)	Conditions for registration and its renewal, quality and safety parameters control of collection of milk and production of milk products in addition to hygienic requirements of the plant, machinery and personnel.
6.	ISI mark of Bureau of Indian Standards (BIS)	Standardisation of various consumer goods including food products and runs a voluntary certification scheme known as 'ISI' mark for processed foods.
7.	Agricultural grading and Marketing (AGMARK) (1937)	AGMARK is a voluntary scheme of certification of agricultural products (raw and processed) for safeguarding the health of consumers.

Since the government had several regulations and laws, food industry found it cumbersome. A need was therefore felt to integrate all such laws for regulating the quality of food. With this in view, Indian Government has passed Food Safety and Standards Act (FSSA), 2006, to bring the different

pieces of legislation pertaining to food safety under one umbrella. Fig. 1.13 shows the various prevailing laws being covered under FSSAI.

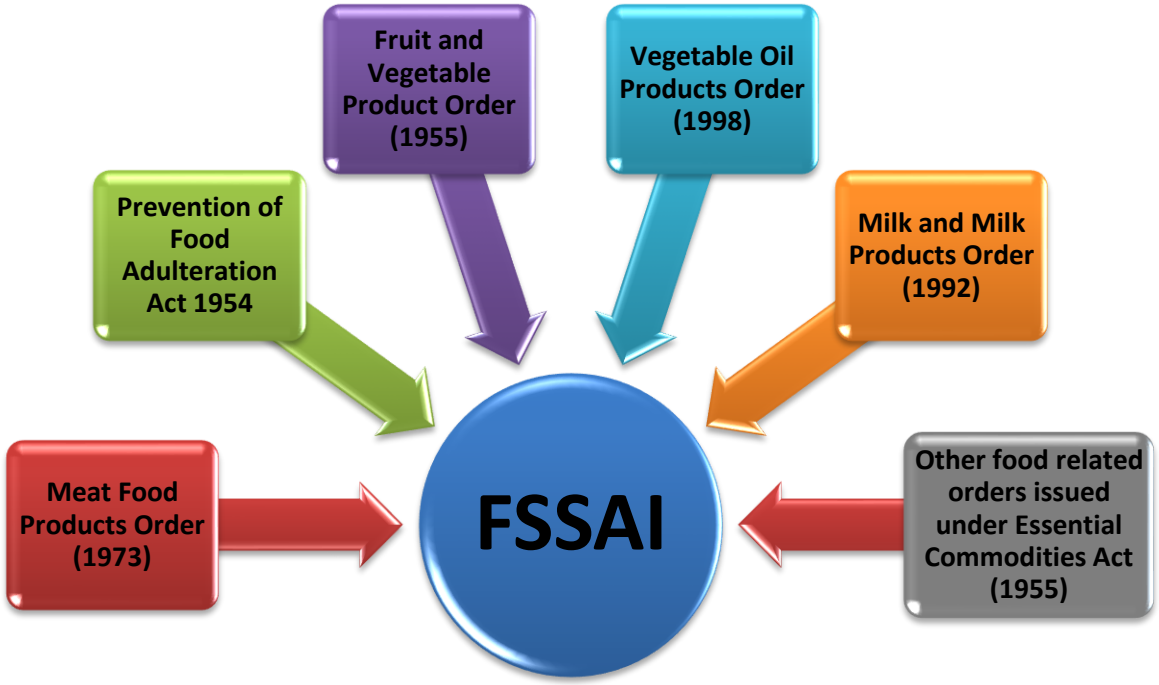

Fig. 1.13: Legislations covered under FSSAI

Food Safety and Standards Authority of India (FSSAI)

The Food Safety and Standards Act was passed by the Indian Parliament on August 4, 2006 to oversee the standards of food safety. After 2 years of passing this act, the Food standardization and regulatory agency Food Safety and Standards Authority of India (FSSAI) was formed. The FSSAI comes under Ministry of Health & Family Welfare, Government of India.

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

Role and function of FSSAI

The main role of FSSAI is to bring together the scientific community and the various regulatory agencies in the country to initiate an integrated food safety regulatory framework. FSSAI performs the following functions:

1. Set standards of food products
2. Develop safe food practices
3. License food businesses
4. Ensure compliance through inspections

5. Test food for standards
6. Train and build capacity
7. Citizens Outreach

FSSAI is responsible for framing of regulations for implementation of standards and guidelines of food safety, food safety license and certification for food businesses. FSSAI collect data about contaminants in foods products, identification of risks along with creation of alert system and create awareness in the citizen of nation about food safety and food standards.

Conclusion

It would be unimaginable to view the food industry either nationally or internationally without the regulatory umbrella of food laws for meeting different standards in the industry. In this session, we have touched upon the relevant food standards in our country along with the role and functions of FSSAI, who is the overarching authority in this area.

I strongly feel that there is a need to add one smaller sub-topic on 'Steps to be taken by consumer in case of Food Poisoning' or 'How to raise a complaint via FSSAI, against adulterated food or unsafe food practices'

What have you learned?

After completing this Session, you are able to:

- describe food standards and food laws
- explain food standards regulations in India
- discuss Food Safety and Standards Authority of India (FSSAI

Practical Exercises

Activity

1. Collect the packets of bread, biscuits, and spices. Observe and note down if any symbol is printed on packaging. Find out the meaning of the symbol printed on packaging of the product.
2. Visit the FSSAI website https://fssai.gov.in/index.php?page=standards.php

Check Your Progress

I. Multiple choice Questions

1. Prevention of Food Adulteration Act enacted in the year of……
   a. 1955 b. 1954
   c. 1946 d. 1959

2. Fruit and Vegetable Product Order was enacted in the year of……
   a. 1955 b. 1954
   c. 1946 d. 1959
3. Vegetable Oil Products Order enacted in the year of
   a. 1955 b. 1954
   c. 1998 d. 1959
4. Standardisation of various consumer goods including food products and runs a voluntary certification scheme known as….
   a. ISI b. PFA
   c. FPO d. GHP
5. Certification of agricultural products is done through
   a. AGMARK b. FPO
   c. ISI d. PFA

II. Mark the statement TRUE or FALSE:

1. FSSAI was passed in the year 2014.
2. FSSAI provide license to food business.
3. FSSAI covers all the laws enacted before 2006 under one umbrella.
4. ISI mark is set by Bureau of Indian Standards (BIS).
5. Milk and Milk Products Order was passed in the year of 1995.

III. Fill in the blanks

1. Full Form of FSSAI is _____.
2. Essential commodity act was enacted in the year of _____.
3. Processing of meat products was licensed under _____ order.
4. Food business license are issued by _____.
5. BIS stands for _____.

IV. Short answer type questions

1. Describe various functions of FSSAI.
2. Explain various legislations prevailing before 2006.
3. Enlist legislations covered inder FSSAI.
4. Discuss the role of FSSAI .

Module 2 Hygiene and Sanitation

INTRODUCTION

You have studied in class 9th textbook "Baking Technician" about personal hygiene, cleanliness and sanitation of work areas and machineries. In this module, you will be acquainted with these aspects in a detailed way. In the previous module, you have learnt about the various aspects of food safety and quality. You have also learnt about the various food safety hazards occurring during various stages of food production. Another important dimension of food safety is through maintaining hygiene and sanitation which we will learn in this module.

SESSION 1: MAINTAINING HYGIENE AND SANITATION

Hygiene in the food sector is an issue of utmost importance. High hygienic levels assure the safety and quality of end products and therefore consumer's health. Hygiene deals with preserving good health and is related to professional cleanliness. Thus, hygiene leads to maintenance of health and prevention of spread of diseases. A Baking Technician has a greater responsibility to prepare bakery items with utmost hygiene and sanitation.

If the consumer falls ill due to food-borne illness caused by poor hygiene and sanitation, the image of the bakery unit is tarnished. Hence, with all other aspects, hygiene and sanitation holds a significant place in any bakery outlet.

Hygiene and Sanitation in Bakery

In reference to bakery, hygiene means maintaining the staff and bakery unit in clean and contamination free conditions. The main purpose of hygiene is to fulfil the food safety rules, regulations and meet the moral obligations towards the consumers.

Food Hygiene

Food is potential source of infection and is liable to contamination by microbes at any point during its journey from the producer to the consumer. Food hygiene is a set of measures necessary for ensuring the safety and

wholesomeness of food at all stages beginning with its production to final consumption.

In the context of bakery, hygienic practices consist of the production and serving of bakery items which are free from any kind of contaminants or toxic substances. The primary aim of food hygiene is to prevent food borne illnesses and food borne intoxication.

Food borne illnesses

Food borne illnesses is caused due to consuming food containing harmful microorganisms, which subsequently grows and multiplies in the intestinal tract.

Food poisoning

It is also known as food borne intoxication. It is caused due to consuming food containing toxins. Such toxins are produced by harmful microorganisms, chemical contamination or are naturally part of plant.

The most common symptoms of food poisoning are diarrhoea, vomiting, nausea, fever and most common food borne diseases are cholera, typhoid fever, tapeworm infection.

Food hygiene and sanitation in a bakery

Food hygiene must be maintained during processing, preparing, transporting, handling and serving of food to ensure that it is safe for human consumption. Bakery products are subject to physical, chemical and biological spoilage. The main sources of contamination in a bakery are food handler, surfaces, air, water, and pests. Thus, when dealing with hygiene and sanitation in bakery following broad categories must be kept into consideration:

Personal hygiene and sanitation

Personal hygiene deals with hygiene or sanitary conditions of an individual. Bakery worker can eliminate the possibilities of infection which they may carry on their body, hair or clothes by following hygiene and sanitation standards. Following are the Standard Operating Procedures (SOP's) to be practiced to maintain personal hygiene in a bakery:

2.4.1.1 Maintaining Hands Hygiene

Hands are the definite source of contamination in the food industry. Washing Hands as per the hygiene standards is very important. Wash your hands for 20 seconds with soap to remove dirt, germs and bacteria. This will prevent the contamination to bakery products.

SOP's for clean hand includes:

1. Wash your hand
2. Sanitize your hand
3. Wear gloves before you start work

The steps of proper washing of hands is shown in Fig.2.1.

Fig. 2.1: Steps of proper handwashing

Hands hygiene is maintained by adopting following measures:

1. Wash hands before and after food handling.
2. Wash hands after touching face, nose, cleaning table, using washroom or handling garbage.
3. Use hand sanitizer to disinfect your hands.
4. Keep nails clean, short and polish free.
5. Never wear ring, wristwatch or bangles during food handling
6. Person with any skin diseases, having pus, cuts, burns should not come in contact with food.

Maintaining hair hygiene: Hair hygiene is very crucial and steps for maintaining hair hygiene are illustrated in Fig.2.2.

Fig. 2.2: Steps for maintaining hair hygiene

Maintaining clothes' hygiene: Always follow the below mentioned practices to maintain clothes' hygiene as shown in Fig. 2.3.

Fig. 2.3: Consideration for maintaining clothes' hygiene

Good practices of sanitation: Other important considerations which need to be practiced in a bakery are:

1. Cover your mouth and nose while coughing or sneezing.

2. Consumption of tobacco, cigarettes, bidi or chewing pan is prohibited in bakery unit.
3. Never touch your nose, eye, ear or mouth while working in food preparation area.
4. Never eat in production and service areas. Use a clean spoon each time for tasting food.
5. Regular medical check-ups of all bakery workers.
6. Bakery workers suffering with contagious diseases, may not be allowed to work in food production.
7. Provision of first aid box.

Building and layout of bakery unit: The salient features regarding the buildings of the bakery unit and its layout are described in Fig. 2.4.

- Plant layout should be designed, constructed and maintained to prevent entry of insects and rodents
- The building shall provide adequate working space, flow of materials,equipment, products and personnel
- Physical separation of raw food area from processed food area to prevent any cross-contamination
- Provision for inward and outward vehicle movement for recieving and dispatch
- Ceilings and walls must be designed to prevent spaces for insects and pests growth
- Walls and ceilings must be free of flaking paint and plaster
- Floors must be non-slippery and sloped appropriately, to allow drainage

Fig. 2.4: Salient features of the building and layout of the bakery unit

Maintaining Equipment and containers

1. Equipment and containers must be hygienically designed, constructed and maintained in good order.
2. They must be made up of food grade materials (Stainless steel, plastic, iron, silicone etc.)
3. Chipped or enamelled containers are not to be used.
4. Food contact surfaces and edges must smoothly bonded to minimize accumulation of food particles, dirt, foreign matter etc.
5. Equipment must be located and installed in a manner which facilitates cleaning and maintenance. Ideal gap of minimum 1 feet from wall must be maintained.
6. Equipment must be self-draining in wet process areas and appropriately connected to drain lines.
7. Where possible, CIP (Cleaning in Place) method should be followed.

Table 2.1: Important practices to be ensured to maintain hygienic equipment:

Equipment/area	**Practices for maintaining hygienic equipment**
Ovens	Ensure that all the burners and elements are turned off before cleaning. After every shift or work cycle oven must be cleaned and sanitized.
Pots, pans, utensils and tools	All the pots, pans, cutting boards, knives and tools must be washed, cleaned and sanitized after every work cycle.
Refrigerators and Freezers	The temperatures should be recorded and calibrated if required. Older manufactured bakery items must be stacked in front and latest in the back so that easily used in a first-in, first-out (FIFO) and First expire first -out (FEFO) order**.**
Range Hoods/Ventilation System	The purpose of hoods or ventilation system is to remove the air of cooking, grease, dirt and dust. Hence to eliminate the risk of fire or contamination, it is a mandatory to keep the range hood, ventilation system and its filters clean.
Sinks	In the end of every shift sinks are checked. Soiled sinks must be washed with disinfectant detergent, wiped thoroughly and sanitized
Working tables	Working tables must be cleaned and sanitized after every work cycle.
Food preparation areas	After every work cycle it is mandatory to clean and sanitize whole food preparation area

Maintaining water hygiene: The salient features regarding the supply of hygienic water in the bakery unit are described in Fig. 2.5.

Fig. 2.5: Maintaining water hygiene in bakery

Management of bakery wastes

1. Provision of separate facilities for cleaning food, utensils and equipment to prevent contamination.
2. The sinks designated for cleaning food material should not be used for hand washing or any other personal activity.
3. The facilities must be made up of corrosion resistant material,
4. Drains must be designed to meet expected flow loads.
7. Provision for separate storage of biodegradable & non-biodegradable wastes.
8. Waste should be kept in covered bins with foot operated hinged lids having proper liners/ garbage bags.
9. Garbage must be segregated and stored in color coded bins till disposal.

Pest control

Birds, insects and rodents are potentially a major contamination problem in bakeries. A preventive pest control program should be maintained covering all areas of plant to minimize pest infestation.

1. Keep all exterior openings closed tightly.
2. Check doors for proper fit as part of the regular cleaning schedule.
3. Dispose of garbage quickly and correctly to avoid growth of pests.
4. Only use garbage containers with lid.
5. Wash, rinse and sanitize the garbage bins on regular basis.

Communications for hygiene and sanitation

1. The cleaning schedules, roasters, procedures, manuals and processes must be documented and communicated both to the employees and other stakeholders.
2. Hygiene and sanitation posters must be placed at appropriate places to remind and ensure food safety practices.
3. Food hygiene and sanitation training sessions must be conducted on a continuous basis.

Conclusion

The session emphasizes the need for hygiene and sanitation in bakery operations along with personal hygiene. Hygiene and sanitation must be a credo with all the employees of the bakery unit for hygiene of hands, hair, clothes and general hygiene. The session outlines the important practices for maintaining hygienic equipment and the importance of communications in a successful hygiene programme.

What have you learned?

After completing this Session, you are able to:
• Explain and follow hygiene and sanitation practices in the work area
• Discuss the cleaning and sanitization of equipment and utensils

Practical Exercises

Activity

1. Visit a bakery in your nearby vicinity and observe following:
   - the staff
   - the production area
   - sale counter

   Comment on hygiene and sanitation practices adopted in the bakery unit.
2. Demonstrate steps of proper hand washing before your teacher.

Check Your Progress

I. Multiple choice Questions

1. Hygiene means maintaining the staff and bakery unit in clean and …… free conditions

   a. pollution b. dust
   c. contamination d. moisture

2. ..... can contaminate food and cause infection at any point of production.
   a. microbes b. rodents
   c. handler d. all of the above

3. Food borne illnesses and food borne intoxication are prevented by practising.....
   a. handling b. washing
   c. food hygiene d. cooking

4. Hygiene or sanitary conditions of an individual refers to .....
   a. Personal hygiene b. food hygiene
   c. bakery unit hygiene d. food safety

5. Hands are washed at least for.....seconds
   a. 20 b. 10
   c. 5 d. 100

II. Mark the statement TRUE or FALSE:

1. Unhygienic food and work area does not cause illnesses to consumers.
2. Sanitizer are used for disinfection of the hands.
3. Food handler suffering with contagious disease is allowed to work in food production area.
4. Physical separation of raw food area from processed food area does not prevent any cross-contamination.
5. Stainless steel, plastic, iron, silicone are considered food grade materials.

III. Fill in the blanks:

1. Use of garbage containers with _____ is recommended.
2. Removal of the air of cooking, grease, dirt and dust is possible through provision of.....
3. CIP stands for.....
4. FIFO stands for_____
5. FEFO stands for_____ basis.

IV. Short answer type questions:

1. Define hygiene and sanitation in your own words.
2. Explain the importance of pest control in bakery.
3. Write the methods to track the application of hygiene practices in the work place.
4. List steps involved in cleaning kitchen equipment.
5. List steps involved in cleaning day to day kitchen utensil.

SESSION 2: SAFETY PRACTICES AT THE WORKPLACE

Workplace safety is very important for bakery workers as commercial kitchens have numerous hazards. If these hazards are not managed correctly, then it may result in the possibility of severe injury. The session covers the various steps which are required to be taken to avoid such hazards and ensure safety of the workers.

Major potential safety hazards at work place are shown in Fig. 2.11.

Fig. 2.6: Potential safety hazards at work place

Knife Cuts

Most injuries are caused due to either wrong selection/handling of knife or due to dull blade. Well maintained and sharp knives should be used as dull blades easily slip off food and may cause injury.

In case of knife cuts adopt the following actions:
1. Sit comfortably.
2. Hold the cut finger tight, in an upright position.
3. Take deep breaths and try to breathe normally.
4. Apply antiseptic cream on the cut wound.
5. Once the bleeding stops, dry the wound with cotton, place a bandage and finally wear a finger cap.
6. In case bleeding does not stop, visit the doctor.

Minor burn

This is the most common hazard as the bakery worker has to directly deal with hot surfaces, direct flame, hot oils, hot pots, pans and trays etc. Always wear protective clothing like chef coat, heat resistant gloves and safety shoes.

In case of minor burns adopt the following actions:
a) Immediately hold the burnt part of your body under running cold tap water.
b) Spray burn relief spray on the burnt part from a distance, so that the spray covers up maximum surface area and at the same time the pressure of the spray does not damage the burnt area.
d) Do not cover the burnt surface area with any bandage for faster recovery.

Injury from machines

Working with high capacity commercial machines involves high risk of physical injury to its handler, if machineries are not handled properly, carelessly or is malfunctioning. Employee must be trained before operating any machinery like ovens, dough sheeter, dough mixer etc. SOP's must be followed at all times to prevent any hazard. All the machineries must be checked and serviced regularly and record must be maintained. In such a situation visit the doctor for treatment and verification of the extent of injury.

Slips, trips and falls

Injuries may also happen due to liquid or oil spills, wet or overly polished floors and uneven surfaces. Hence, floors must be kept clean dry and free

from any spillage. Always wear non slippery safety shoes. Visit the doctor immediately for treatment and verification of the extent of injury.

Muscle injuries

Improper handling or posture while lifting, pushing, pulling or bending during carrying heavy weight may result in muscle strains and injury. Therefore always maintain correct posture while lifting heavy objects and seek help when required. Do not store any object above eye level. Seek doctor's advice for treatment and verification of the extent of injury.

Head and eye injuries

Most of these injuries occur due to overhead hanging shelves or accessing tight, confined places, shelves or walk-ins. Other cause of head and eye injury includes spillage of hot oil, steam or water. Never spill water in hot oil. Maintain proper distance while opening oven door to prevent steam shock and head injury. Immediately reach out for medical assistance without loss of time.

Chemical hazards

It is very important to understand the usage and application of various chemicals such as ammonia, chlorine etc. along with its handling hazards. Chemicals must be stored below eye level and at a secure and dry location. Every chemical is clearly marked with the name, hazard caution and procedures of handling it. Every employee must be trained for handling and application of such chemicals. In such a situation visit the doctor for treatment and verification of the extent of injury.

Fire hazards

Due to presence of hazardous fuels, flammable liquids, gases and various chemicals, possibility of accidentally igniting fuel sources is very high. Such accident may result in severe burn injury which may even lead to death. Therefore, immediately call the doctor for medical assistance and simultaneously send SOS call to the fire brigade.

Electric shock

Electric shock may happen due to the improper handling, faulty wiring, improper earthing, wet hands etc. Seek doctor's advice for treatment and verification of the extent of injury.

Safety Signs and Symbols

Safety signs and symbols are important communication tools for maintaining safety. Their purpose is to inform the presence of various hazards and safety instructions to be followed at workplace. Safety signs and symbols are standardised and consist of messages, words and pictorial symbol with variety of sizes, shapes and colours denoting different specific meaning.

Shapes and colours of safety signs

The shapes of workplace health and safety signs are triangles, circles and squares or rectangles. Each shape has different purposes which are given in Table 2.5. The colours used in workplace safety signs and symbols are red, yellow, blue and green and are used to indicate specific information (Table 2.6).

Table 2.5: Safety shapes

Shape	Meaning
Triangles	Indicates caution (potential hazards) or warning (definite hazards). For example, toxic gas or electric shock. 
Circles	Indicates mandatory actions and used to depict an action one must do. For example, wearing safety gloves while handling hot surfaces. 
Squares or rectangles	Indicates general information if the rectangle is green and indicates emergency information if the rectangle is in red colour. 
Circle with diagonal slash	Indicates forbidden or prohibited actions. 

Table 2.6: Safety colours

Colours	Meaning
Red signs	Indicates emergency devices like firefighting equipment or emphasize unsafe or forbidden actions.
Yellow	Alerts workers to take caution and be alerted of hazards, reducing necessary risks.
Blue	Indicates a particular action or behaviour. For example instruction to wear personal protective equipment.
Green	Indicates the location of emergency measures or equipment like first aid kits, evacuation routes, fire exits, escape ladders, or fire assembly points.

Table 2.7: Safety symbols used at workplace

S.N.	Symbol	Description
1		The symbol is used to instruct the staff to cover food with foils, wraps or lids to prevent droppings, insects, dirt etc.

2.		"Keep food out of the danger zone" sign is placed near walk-ins, food storage racks and workstation to cook and store food at the best suited temperature to prevent any food hazard.
3.		The symbol is used to instruct the staff for regular verification of storage temperature.
4.		The symbol is placed near storage walk-ins and food storage racks to prevent possibility of contamination.
5.		Placed near storage walk-ins and food storage racks for marketing of food in the order they have been prepared. This symbol is a reminder for adopting the FIFO (first- in-first-out) approach.
6.		The symbol is placed near work station to remind the staff about food safety standards and operations.

7		The symbol is placed on those water taps whose water and sinks design is suitable for washing of equipment used in food preparation.
8		The symbol is placed on those water taps whose water and sinks design is suitable for washing of raw food.
9.		The symbol is placed on those water taps which are only assigned for washing hands and are equipped with hand wash, paper napkins and sanitizers.
10.		The symbol is placed on those water taps which dispense drinking water.
11.		The symbol is placed near those water taps whose water is not suitable for drinking but can be used for washing utensils, work station, floor, etc.
12.		The symbol is placed before the bakery department.
13.		The symbol is placed near entrance and workstation to remind staff to wear chef cap and hairnet.
14.		The symbol is placed near work station to remind the staff for wearing apron to protect the uniform from getting soiled or stained.

15.		The symbol is placed on such water taps which supply very hot water for cooking and cleaning purpose.
16.		The symbol is placed near entrance of kitchen, wash basins and staff toilets.
17.		Such boards are placed on the floor while cleaning is in progress to avoid any kind accident or injury due to slippage.
19		The symbol is placed near entrance, corridors, public area, staff room, kitchen and staff canteen.

Precaution in Handling Heavy Equipment

Commercial and heavy-duty equipment provide ease of work when handled as per guideline. But handling heavy kitchen equipment can be sometimes hazardous if they are not handled properly. The precautions in handling some of the heavy equipment in bakery are as follows:

Dough mixers

The equipment (Fig. 2.7) is used to prepare bread dough, biscuit dough, cake batter, meringue etc.

Precautions

- Place the mixer bowl firmly for safe operations.
- Select the appropriate paddle for safe and effective use.
- Close safety lid during operations to avoid any accident.
- Always start mixer at lowest speed and gradually switch to desired speed.

- Keep body and hands away from the machine while operation.
- Switch off machine if work has been completed.
- Remove the paddle safely for washing.
- Clean the machine and safety lid after every production cycle.
- Never add any ingredients in a running machine.
- Never stop a machine in between operation unless extremely important to do so.
- Never open safety lid for checking the status of work in a running machine.
- Never leave safety lid open in a running machine.
- Never allow cloth, utensils or body into running machine as it may cause severe injuries even at very slow speed.

Fig. 2.7: Dough Mixer

Dough Sheeter

The machine used to roll the dough to form the desired thickness of sheets of dough (Fig. 2.8).

Precautions

1. Place the machine firmly at even surface.
2. Clean the dough sheeter before and after every operation to prevent contamination.
3. Always start dough sheeter at lowest speed and gradually switch to the desired speed.

Fig. 2.8: Dough Sheeter

4. Keep hands and body away from the roller while operating.
5. Switch off the equipment if work has been completed.
6. Never add any ingredients in a running machine.
7. Never stop a machine in between operation until very important.
8. Never allow clothing, utensils or body into moving machine as it may cause severe injuries even at very slow speed.
9. Never push the dough with hands.

Oven

Oven is used for baking various bakery food products.

Precautions

- Check the oven at the beginning of every production cycle.
- Open and wipe the chamber of oven daily before using it.
- Preheat the oven at desired temperature.
- Use only the suitable moulds, tray and pans for baking.

- Always wear protective gears while operating the oven.
- Switch off the oven after the work is finished.
- After the oven has cooled, clean for any spillage inside it.
- Wear safety shoes while working with oven.
- Never open the oven doors during baking unless urgently required.
- Never place any plastic or rubber product inside or near the hot oven.
- Never overload the ovens.
- Never wash the baking chambers of oven.

Mixer Grinder

This machine is used for blending, mixing and grinding of food (Fig. 2.9).

Precautions

- Always keep the mixer grinder on even surface.
- Always check the jars for cleanliness and defects before every use.
- Firmly fix the lids of jars.
- Always increase the speed of mixer gradually.

Fig. 2.9: Commercial Mixer

- Always switch off the mixer grinder before removing the jars.
- After using the jar, clean them with vinegar and water solution and run it for a few seconds. Then rinse with warm water thoroughly to remove the smell.
- Never blend hot ingredients in the jar as it may cause injury to the handler.
- At least ¼ of jars must remain empty for smooth and efficient operations.
- Never put very hard ingredients as it may damage jar as well as the mixer e.g., rock salt.
- Never open the lid of the jars while mixer is running.

Conclusion

Safety of workers is the first concern in a bakery unit. The various safety hazards that can happen in a bakery unit along with the actions that are taken in such situations are discussed in the session. To avoid these hazards a number of safety signs and symbols are employed in the bakery industry which have been extensively discussed in the session. The risks associated with handling heavy equipment and the precautions to be taken to avoid such risks have also been given in the session.

What have you learned?

After completing this Session, you are able to
- explain workplace safety practices in a bakery
- describe and identify various safety sign and symbols used at workplace
- discus dos and don'ts of handling heavy equipment in bakery

Practical Exercises

Activity

1. Identify safety hazards in your school and prepare a brief note on how to deal with them.
2. Identify the safety symbols used in your schools.
3. Draw 5 safety symbols used at workplace.

Check Your Progress

Multiple Choice Questions

1. In bakery kitchen most injuries are caused due to knife because of
   a. wrong selection of knife
   b. wrong handling of knife
   c. hurry and inattentiveness
   d. all of the above

2. Inappropriate body posture lifting, pushing, pulling or bending during carrying heavy weight
   a. muscle injury
   b. nerve injury
   c. bleeding
   d. burn hazard

3. Chemicals must be stored ..... eye level
   a. below
   b. equivalence
   c. above
   d. hidden from

4. Colours of safety signs includes red, yellow, blue and ..... to indicate specific information.
   a. green
   b. orange
   c. grey
   d. black

5. Mandatory actions which one must do are usually depicted in .....shape
   a. circle
   b. triangle

c. rectangle d. oval

Mark the statement True or False.

1. General information is indicated if the rectangle is red.
2. Circle with diagonal slash indicates forbidden or prohibited actions.
3. Red coloured symbols indicates a particular action or behaviour or instructions.
4. Location of emergency measures or equipment like first aid kits, evacuation routes, fire are indicated in green color.
5. Keep food out of the danger zone" sign has instruction for storing food at their best suited temperature. True

Fill in the Blanks

1. Burns are most common _____ in bakery.
2. _____ is used to blending the food.
3. Cuts and wounds must be always_____ before handling food.
4. _____ colour alerts workers to take caution and be alerted of hazards, reducing necessary risks.
5. Never blend _____ ingredients in the jar as it may cause injury to the handler.

III. Short answer type Questions

1. List any 5 potential hazards at work place.
2. Draw any 5 sign boards.
3. Write do's and don'ts of dough sheeter.
4. List the steps to be followed in case if a finger gets cut due to a knife.

SESSION 3: DISPOSAL OF WASTE

A variety of waste such as left-over food, spoiled raw material, food trims, plastic, containers, packaging materials is produced in bakeries. This waste can be recycled or physically and biologically treated. The waste management system helps in disposal of bakery waste and reduce its adverse effects on the environment.

Kitchen wastes management:

The important considerations for proper waste management in bakery kitchens are given below:

1. Food handlers should never handle waste during or before handling food.
2. Use bin liners or polythene to line inside garbage bins for ease of operation and to keep the bins clean. Foot operated bins are preferred.
3. Always close the lids of garbage bins. Garbage bins are never over filled.
4. Collect dry and wet waste separately. Dry garbage is segregated considering the criteria of recycling. Segregate sharp objects like glass pieces separately.
5. Remove the waste from garbage bins as per defined schedule or when required.

Physical method of waste treatment

In this method, the waste is recycled or reused to form a new usable product without altering its chemical or biological properties. The following are the different types of physical treatment of kitchen waste:

Recycling

Recycling refers to both the direct reuse of the used products or recycling of the product for another purpose. The used materials like metal, glass, plastic, paper etc. are recycled to produce new products. The symbol in Fig. 2.10 is carried on materials which are capable of recycling.

Fig. 2.10: Recycling symbol

Incineration

Combustible waste which is not suitable for recycling is sent for burning in incineration plants or waste wood furnace.

Landfills

Residues or waste which is not suitable for recycling or thermal treatment are sent to landfills.

Waste Compaction

Materials like metal, cans, containers and plastic bottles are heavily compacted to form blocks and sent for recycling. This process helps in the disposal of waste and save the cost of

transportation.

Fig. 2.11: Compaction Machine

Biological method of waste treatment

In biological methods of waste treatment, the microorganisms break down the biodegradable waste into organic matter. The following method are used for this purpose:

Biogas

Biodegradable kitchen waste such as food waste, vegetable trims etc. is convertible to gas by the process of degradation with the help of bacteria, fungi and microbes etc. The gas produced by this procedure is known as biogas. This biogas can be used as fuel and the residual matter is used as manure.

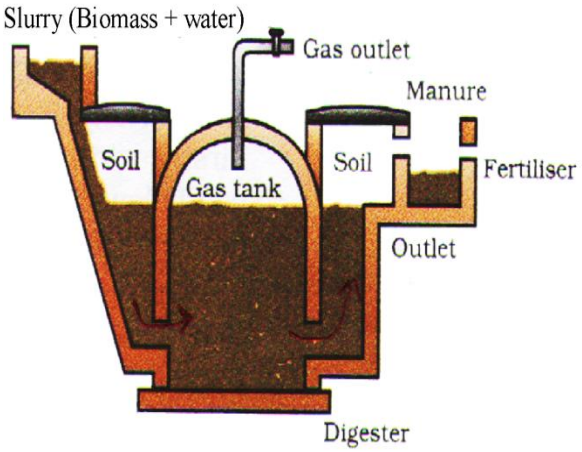

Fig. 2.12: Biogas tank

Composting

Every organic material decomposes with time. If these organic waste materials are processed then it can be converted to high quality manure. The process of composting starts with the dumping of these organic wastes under the layers of soil with microorganisms such as bacteria and fungi. Then the result will be nutrient-rich manure which also helps in water retention in the soil.

Fig. 2.13: Compost pit

Vermicomposting

In this process worms are exposed to the organic kitchen waste for the process degradation. Earthworms consume and digest organic matter of the waste and produce by-product of digestion, this by product is very nutrient-rich manure for soil.

Fig. 2.13: Earthworms

Conclusion

In this session some canons of kitchen waste disposal including physical and biological methods of waste treatment are discussed. Proper and fast disposal of bakery waste of various type keeps the environment of the production unit clean and vibrant.

What have you learned?

After completing this Session, you are able to:
- describe the kitchen waste
- explain and physical and biological waste management
- dispose kitchen waste safely and correctly

Practical Exercises

Activity

1. Visit a nearby bakery and observe the following:
   (i) types of bakery kitchen waste produced on day to day basis
   (ii) adopted procedure for bakery kitchen wastes management
   Comment on procedures adopted for waste segregation and waste disposal.
2. Identify recyclable waste around you and suggest the ways in which the identified waste could be recycled.

Check Your Progress

1. _____are used to line inside garbage bins for easy removal of garbage and to keep the bins clean
   a. bin liners b. papers
   c. envelopes d. jute bags

2. Recycling is a_____ method of waste treatment.
   a. Physical b. chemical
   c. biological d. all of the above

3. _____ converts organic waste materials into high quality manure.
   a. recycling b. incineration
   c. composting d. compaction

4. _____ is a nutrient-rich manure for soil.
   a. vermicompost b. triangle
   c. rectangle d. oval

I. Mark the statement True or False.

1. Papers can be recycled.
2. Wet and dry garbage are stored together.
3. Vegetable trims can be converted in to manure
4. Metals waste cannot be recycled.
5. Earth worms are used in the process of vermicomposting.

II. Fill in the blanks

1. _____ refers to direct reuse of used products.
2. _____operated bins should be preferred.
3. _____ and _____ are recyclable waste.
4. Every organic matter _____ with time.
5. _____ fill can be harmful for nature.

III. Short answer type questions

1. Enlist any 4 biodegradable kitchen wastes.
2. Explain vermicompost.
3. List various drawbacks of landfilling.

Module 3 Essentials of Baking

INTRODUCTION

The four essentials of baking are raw material, ovens, methods of preparations and packaging and storage of the finished products. In this module, we will discuss each one of the essentials in detail in each session.

Various types of ovens and their maintenance will also be discussed in this module. You will also learn about the preparation of batter and dough and procedure for cooling, packaging and storing the bakery product.

SESSION 1: RAW MATERIALS

The quality of raw materials play vital role in determining the quality of the final product. Commercial bakeries conscious of maintaining their reputation always use high-quality raw material to consistently deliver quality baked items to their customers.

As discussed in class 9th textbook "Baking Technician", a variety of ingredients are used in bakery. The ingredient must be wisely chosen. It is very important to understand the specifications of quality of each ingredient. For this purpose, "Standard Purchase Specifications" are used for purchase of quality raw material.

Standard Purchase Specifications" (SPS) are the written tools used for selecting the right quality and quantity of the raw materials purchased in bakeries.

The quality parameters for purchase of various ingredients used in bakery are as follows:

Flour

Flours of different types are obtained from milling. The most commonly used flours in bakery are whole wheat flour (Atta) and refined flour (Maida). Various other types of flour obtained from oats, ragi, rye, quinoa, amaranth, buckwheat are also gaining popularity due to growing health consciousness. Thoroughly cleaned grains sourced from a reliable vendor yield good quality baking flour. Bread flour must have 12%-14% protein, cake flour must have 6%-8% protein and cookie flour must have 4%-6% protein. The quality parameters of flour are shown in Fig. 3.1

Fig. 3.1: Quality parameters of flour

Sugar

Sugars impart crust, colour, texture and tenderness to bakery product. It is used in various forms from solid to liquid in different types of preparations. The quality parameters of sugar are as follows:

1. It should be clean, free from any foreign material and properly packed.
2. Grain, icing, castor and brown sugars must be free from moisture and have fine and even grains.
3. Icing sugar must be free from lumps and the corn starch percentage in it must range between 2-5 %.
4. Liquid sugars like invert sugar, glucose syrup must be clear and must be properly sealed when received.

Yeast

Yeast is a natural leavening agent made up of many tiny living organisms that convert sugars present in the dough into carbon dioxide and ethanol. The two types of commercial yeast are dry yeast and fresh yeast. The dry yeast can be used up to one year whereas the fresh yeast has to be used within 10 days. The dry yeast is used on a major scale in industry. The quality parameters for the yeast are as follows:

1. It must be active, free from moisture, strong yeasty smell and cakey lumps.
2. Dry yeast must be properly packaged in air tight packets.
3. Fresh yeast must be properly compressed, wrapped and have a temperature between 2 - 10 °C upon arrival. It must be moist but not wet and slimy.

Chemical Leavening Agents

Baking powder, baking soda (sodium bicarbonate) or ammonium bicarbonate are used as per the requirement of the product for preparation of batters where yeast is not required. All these leaveners come in pre-packed form. The leaveners must be in properly packed, powder form, free flowing and free from moisture. The leavener must be within the expiry period. Only the branded leaveners yield good and consistent results

Eggs

Eggs are an integral part of a large variety of bakery products. Eggs help in retaining moisture, binding different ingredients together, enhancing volume and nutritional value of the products. The quality parameters for the eggs are given in Fig. 3.2.

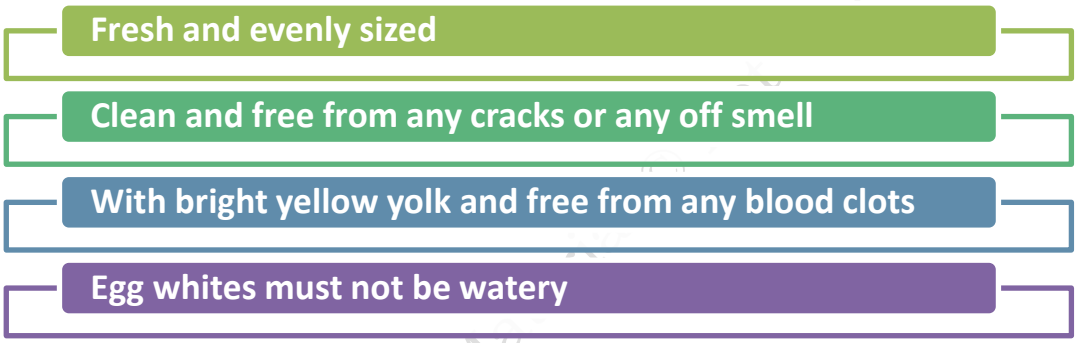

Fig.3.2: Quality parameters for eggs

Fats and oils

Fats and oils are used for shortening, frying and sautéing in bakery. Most commonly used fat in bakery are butter and vegetable oils. Margarine, ghee, and hydrogenated vegetable fat are also used. For quality parameters in fats and oils check if it is properly packed, free from any dark spots, fungus, foul smell, rancidity and sediments or foreign material. It should have a shelf life of minimum 6 months.

Flavouring agent

Flavouring agents are either natural or chemical in nature. They are used as additives to enhance taste and aroma of bakery products. They are also used to impart flavor for food products that do not have their own flavors such as candies and other snacks. The active component of the natural flavoring agents is generally derived from different spices, fruits, vegetables, herbs, barks of plants, flower buds, roots or leaves.

Artificial flavouring agents are chemically synthesized compounds that imitate the natural flavour. Artificial flavouring agents are formulated with the same compounds as is found in natural flavouring agents.
Packaging of the flavouring agent must mention whether it is natural or artificial. It must have minimum shelf life of 1 year when received and free from sedimentation or leakages.

Condiments

These ingredients complement the actual taste and aroma of the baked product. Cinnamon, cloves, garlic, cardamom, cumin seeds, carom seeds ginger and fruits of various types are used as condiments. For example, roasted garlic is used in garlic bread. Condiments can be fresh or preserved. For example, freshly cut fruits or canned fruits can be used as toppings in cakes. They must compliment the product they are going to be used with. The preserved and packaged condiments must have a shelf life of minimum 6 months and free from any foreign material, bad odour, taste or texture

Salt

Salt imparts flavor and texture to the products. Iodized salt, pink salt and black rock salt are commonly used in bakeries. Salt must free from moisture, cakey lumps and any foreign particles.

Additives

The ingredients used to increase the shelf life, improve taste, nutritional value and texture of the baked products are collectively called as additives. Examples of some of the additives are: bread improvers of various types, gluten, calcium propionate, and potassium sorbate. They are only added in recommended dosages.

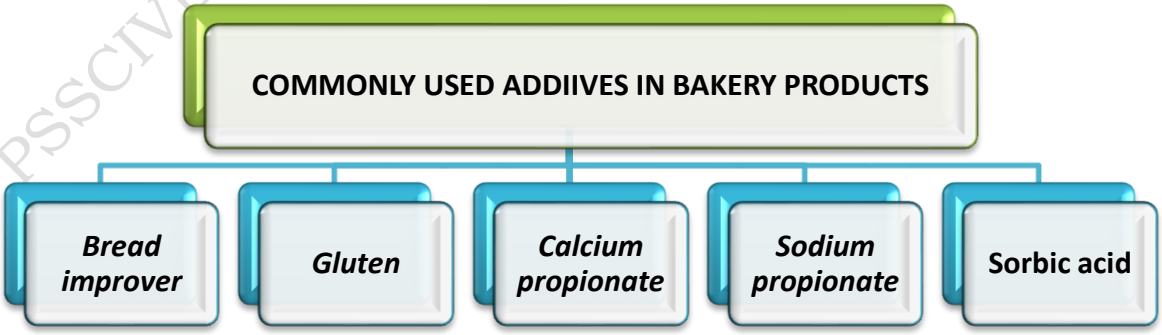

Fig.3.3: Commonly used additives

Bread improver

It is the most common type of additive and is a combination of various enzymes, proteins and vitamins to impart good volume, even crust and colour to the bread. It further reduces the proving time, provides stability to the dough to retain the gases and imparts the desired crumb texture to the bread.

The bread improver is used in recommended dosages as over-dose may result in poor product quality and pose risk to human health.

Gluten

Gluten is a protein obtained from wheat. It is used as additives in weak flours such as millets, which do not have enough gluten in themselves to hold the gases produced during fermentation in bread making.

Calcium propionate

This additive is used as preservative to control microbial growth of fungus and molds. The prescribed limits for its addition are 1- 5 gm per kg of dry flour.

The pH of the dough must be below 5.5 for calcium propionate to work effectively.

Sodium Propionate

This additive is used for the preservation of the cakes to control the growth of microorganism. It also delays the fermentation process, therefore not recommended for breads or rolls.

Sorbic acid

It is an organic compound with naturally strong antimicrobial properties and is used to prevent yeast and mold growth in bakery products.

The general quality parameters for the 5 types of additives discussed above includes absence of moisture, flakes and any other foreign materials, pests or insects and without any cuts on the packets. They must have a shelf life of minimum 6 months.

Conclusion

A number of ingredients like flour, sugar, yeast, chemical leavening agents, eggs, fats and oil, flavouring agents, condiments, salt and additives are used in various bakery products depending on the recipes. For getting a final quality bakery product, it is essential that the quality of the different ingredients is also maintained. The session covers all these aspects in detail.

What have you learned?

After completing this Session, you are able to:

- discuss the quality parameters of raw materials
- enlist the most commonly used additives in bakery products
- describe functions of various additives in bakery products

Practical Exercises

Activity

1. Take 50 g of refined wheat flour, whole wheat flour, corn flour and oats flour separately in a bowl. Now with the help of water, knead each of the flour separately into dough. See and comment which dough is combines easily and is most elastic. Also explain the reason why some flour could combine well while others were not.
2. Weigh 20 g of icing sugar in two bowls separately. Keep one bowl with sugar in open environment and second sample in a zip locked airtight pouch. Explain and note down the difference you observe between both sugars sample along with the reason.
3. Take 2 tablespoon of dry yeast in three test tubes or small bottles. Add 1 tablespoon of sugar and 2 tablespoon warm water in first test tube, 1 tablespoon of boiling water in second test tube and 1 tablespoon of chilled water in third test tube. Stretch balloon over the mouth of tubes or bottle covering them completely. Now shake well and keep the test tubes / bottle undisturbed for 30 minutes. After 30 minutes observe and note down what happens. Find out the reason behind the changes happened in all three test tubes / bottle.

Check your progress

I. Multiple choice Questions

1. A guiding tool used for selecting the right quality and quantity of the raw materials purchase is called .....
   a. Food menu
   b. SPS
   c. list of ingredients
   d. food order

2. Flour having 10-12 % protein is considered most suitable for production of .....
   a. bread
   b. biscuits
   c. cookies
   d. cake flour

3. Cake flour must have 6%-8% of .....
   a. fat b. protein
   c. calorie d. carbohydrate

4. Flour with low protein content is suitable for production of .....
   a. bread b. roti
   c. cookies and biscuit d. cake flour

5. Prescribed limits for calcium propionate addition ..... of dry flour.
   a. 1- 5 gm/kg b. 10- 15 gm/kg
   c. 5-10 gm/kg d. 10-20 gm/kg

II. Mark the statement True or False.

1. Brown sugar has corn starch.
2. Yeast is a chemical leavening agent.
3. Invert sugar is an example of liquid sugar.
4. Baking powder is a natural leavening agent.
5. Watery egg whites are considered good in bakery.

III. Fill in the blanks:

1. _____and _____are used for shortening, frying and sautéing in bakery.
2. SPS stands for _____
3. Calcium propionate and _____ are types of bread improvers.
4. .....are chemically synthesized compounds that imitate the natural flavour.
5. Yeast converts sugar into.....and.....

IV. Short answer type questions

1. What are the quality parameters of flour?
2. Enlist the commonly used additives.
3. Enlist the functions of eggs in bakery products.
4. Define artificial flavouring agents.

SEESION 2: OVENS

Oven is an enclosed cavity or tunnel where dough or batter is surrounded by hot environment and is baked into bread, cookies, sponges, or other products. Different types of manufacturing facilities like a hotel bakery, stand-alone bakery or industrial bakery use different type of ovens based upon their needs and type of product to be produced.

To bake the products, ovens use various energy sources. The energy from these sources is transferred to the baking products by means of radiation, conduction, and/or convection. Different types of fuel are used in ovens such as gas, electricity, coal, wood or diesel.

Gas and electric ovens are most popular because they come in combination of different functions i.e. deck, rotary and convection. However, wood fired ovens are suitable for making pizzas and other flat breads as they impart smoky flavour and crispy crust. Coal fired ovens are sparingly used because of cost of operation but are popular choice for making *naan*, *kulche*, *roti* and other bakery products. To meet the needs of large-scale industrial production of bakery items, the following types of oven have stood the test of time and economy. Constant improvements have been caused in these ovens.

The basic structure and functions of these ovens are given below:

Deck oven

These ovens are designed to heat the baking chamber from both the top and the bottom of the oven. They may be rectangle in shape with a variety of door designs. They are equipped to use both the radiant heat and the conduction heat. These ovens can operate on electricity, gas and diesel.

Convection oven

The convection oven is also known as fan-assisted oven. In this oven heating elements are fitted around a blower to circulate hot air around the food for even and effective heating (Fig.6). The major types of convection ovens are rack, reel, rotary, conveyorized and tunnel.

Fig.3.5: Convection ovens

Direct fired oven (DFO)

In these ovens combusting gas is burnt inside the baking chamber to heat the air and the products. The heat transfer in a direct fired oven is primarily carried out by radiation from the flames and the top, base and walls of the

baking chamber. Direct fired ovens are very efficient because they convert most of the fuel to heat and bake the products. The operating costs and fuel consumption is less in these types of ovens.

Indirect fired oven (IFO)

Indirect fired ovens indirectly heat the baking chamber by using heat exchangers. The by-products of combustion such as carbon monoxide, carbon dioxide, water vapor etc. remain inside the heat exchanger and do not come into direct contact with the material being baked. Thus, the risk of contamination and undesirable odours in the products is eliminated. Therefore, this oven is suitable for delicate bakery products such as cakes and pastries. This type of oven can be run on LPG, diesel or electricity.

Peel brick oven

The peel brick oven has been used since ancient times. It consists of a brick material chamber (Fig. 3.6). The chamber has a floor made of refractory tile which can withstand high temperature and also have a low thermal conductivity for greater energy efficiency. The dough etc. is placed on this floor for baking. These ovens steadily transfer radiant heat to the products and maintain high temperatures inside the baking chamber for prolonged periods of time. Coal and wood are generally used as fuels. The ovens are operated manually and require special skills from the baker.

Fig.3.6: Peel brick ovens

Tandoor

Considering a mushrooming of tandoori dhabas on most of the country's highways, it can be said that the tandoor is the national oven of our country (Fig. 3.7). Historically, most of the villages in north-western India had their own tandoors where the village women will bring their kneaded doughs and bake their breads amid community singing. The oven works on wood, coal or gas. It is built using clay in a cylindrical or a drum shape with an opening on top (Fig. 3.8). It can be placed on top of the floor or fitted inside the floor. It is used to prepare Indian flat bread, *naan, roti, paratha, sheermal and kulcha.*

Fig.3.7: Traditional Tandoor

Fig.3.8: Contemporary tandoor

Maintenance of ovens

Maintenance of an oven eliminates chances of mechanical, electrical, and heating failures and occurrences of food safety hazards such as contamination of product with lubricants or grease during operations. These hazards may pose a risk to consumer leading to a loss of reputation and income of the bakery. Therefore, to avoid such risks, ovens are regularly inspected and maintained.

Ovens are placed at least 2 to 4 inches above the floor level, 1 feet away from walls, and 2 feet away from the exhaust of the oven.

Special attention is paid to parts which are prone to wear and tear such as welded components, belt and gears, steam lines, seals and gaskets, temperature gauges, timer, humidity controllers, exhaust fans, vents, switches and knobs. Preventive maintenance is regularly conducted for minimizing breakdowns during operations. Corrective actions are taken if needed.

Conclusion

The actual process of baking takes place inside the oven. The session discusses the basic structures and functions of some of the widely used ovens in baking industry such as deck oven, convection oven, direct fired oven, indirect fired oven and peel brick oven. Tandoor oven is also discussed given its popularity in India. The session concludes with some maintenance tips about ovens.

What have you learned?

After completing this Session, you are able to:

- explain types of oven
- describe types of fuels used for oven operation
- discuss the maintenance practices of ovens

Practical Exercises

Activity

1. Visit to nearby baking facility to see and prepare a note on:
   - Which type of oven is being used in the bakery?
   - Which type of fuel being used for oven operation?
   - how the oven is being maintained?

Check your progress

I. Multiple choice Questions

1. In ovens, product is baked due to .....environment.
   a. hot b. gaseous
   c. cold d. congested

2. Conduction, convection and ..... are the three modes of heat transfer in ovens
   a. radiation b. air circulation
   c. microwaves d. heat fluctuation

3. Wood fired oven are considered suitable for making .....
   a. cake b. pizzas
   c. bread d. paratha
4. Hot air around the food is circulated through the blower in .....oven.
   a. rotary b. wood fired
   c. peel brick oven d. tandoor

5. Radiation from the flames and the top, base and walls of the baking chamber causes heat transfer in.....ovens
   a. direct fired b. indirect fired
   c. peel brick oven d. tandoor

II. Mark the statement True or False.

1. Oven is used for fermentation of dough.
2. Radiant heat system is the transfer of heat from top to the product through the heated air of the baking chamber.
3. The convection oven also known as a fan-assisted oven.
4. Indirect heating of the baking chamber is achieved using heat exchangers in direct fired oven.
5. Ovens are placed at least 10 inches above the floor level.

III. Fill in the blanks:

1. _____ is Indian traditional oven which works on the coal or gas.
2. DFO stands for _____.
3. _____ tile is having resistance to high temperature is used in peel brick oven.
4. Deck ovens have both the radiant and ..... heat system.
5. The by-products of combustion in ovens are....., carbon dioxide and water vapour.

IV. Short answer type questions

1. Enlist different types of ovens.
2. Differentiate between IFO ovens and DFO ovens.
3. Enlist types of fuels used for oven.
4. Describe the importance of maintained oven.

SESSION 3: PREPARATION OF BATTER AND DOUGH

The word batter literally means to beat vigorously. Batters are mostly prepared for cakes, muffins, cupcakes, waffles and pan cakes etc and also coating for fried foods too. Batters are usually thinner and are mixed with an electric mixer with a whisk attachment, hand blenders or manually with a whisk or spoon too. It is generally a mixture of flour, egg, sugar and water or milk. It is thin enough to be dropped from a spoon and thick enough to be piped from a piping bag too. It needs to be shaped by a baking form or baking mould to hold its shape. The flowing consistency of the batter may vary from thin (Fig. 3.9) to thick (Fig. 310) as per the requirements for the product to be baked.

Fig.3.9: Thin batter for pancakes

Fig. 3.10: Thick batter for cupcakes

Methods of batter preparation

Batter preparation is a process in which basic cake ingredients are mixed to form a smooth, aerated and semi-fluid batter. Batter is prepared in a different way as compared to dough preparation. The batter generally has more water, fat, sugar and eggs as compared to dough. It must be noted

that different methods of batter preparation are adopted for different types of bakery items. The batters for cake and muffins are made using the following methods:

Creaming method

The method of softening the shortening agents like solid fat or butter into a smooth mass of cream and blending it with sugar is called creaming method. It is ensured that the butter is at the right temperature. The sugar crystals cut into the butter upon beating which results in tiny air pockets trapped in the cream. That is the reason this method of batter preparation is called creaming method.

The smaller the sugar crystals, larger the quantity of small air pockets. This results in a very light and fluffy textured cake. The trapped air in this creamed batter expands during the baking process. The batter prepared with creaming method gives good volume and light texture to the finished bakery product. This method is used for preparing batter for tea cake and muffins.

Whipping method

Whipping is a process of vigorously beating any or combination of liquid and dry ingredients with the help of a wire whisk manually or in a machine to increase its volume by trapping the air from the atmosphere into the batter. Liquids such as water, oil and milk etc cannot be whipped to increase its volume but eggs and cream can double or triple in volume. In bakery this technique is generally used to beat the eggs and sugar together till they double or triple in volume followed by addition of flour and raising agents while making a sponge cake batter. The aeration helps the batter rise double in volume while baking and soft a sponge textured cake is obtained after baking.

However, over mixing of batter is always avoided as this can lead to release of trapped air in the batter and therefore the cake will not rise while baking and the desired spongy texture will not be obtained.

All-in-One method

In this method all the dry ingredients along with chemical leavening agents such as baking powder and baking soda are sieved and placed in the bowl followed by addition of other liquid ingredients such as milk, water, eggs, yoghurt etc. and blended slowly by a manual hand whisk, or a machine whisk until all the ingredients are blended to a smooth pouring consistency

batter. Banana cake, red velvet sponge cake are examples of cake batters made using this method.

Preparation of cake batter

Here an example of preparation of a batter is given below. This batter can be used to prepare either tea cake or muffin or cupcake by using different baking moulds.

Recipe of tea cake batter		
S. No.	**Ingredients**	**Quantity**
1.	Flour	1000 gm
2.	Castor Sugar	1000 gm
3.	Butter	1000 gm
4.	Egg	1000 gm (20 no.)
5.	Milk	100 ml
6.	Vanilla Extract	20 ml
7.	Baking Powder	50 gm
8.	Salt	2.0 gm

Steps of preparation

1. Pre heat oven at 160 °C and pre-grease cake moulds.
2. Attach a batter pedal in the planetary mixer. Put the butter and sugar in the mixing bowl. Run the machine and set at low speed (speed no. 1) for 3-4 minutes until all the butter and sugar is mixed together. Once its mixed increase the speed to medium (speed no. 2).
3. Meanwhile break all the eggs in a bowl, add vanilla in it and whip it with a hand whisk till egg yolks and egg whites are mixed properly. This eases the emulsion of eggs into fats.
4. Add whipped eggs in 3-4 installment and mix well with the batter. This is our whipped nixture.
5. Meanwhile sift twice the flour, baking powder and salt together.
6. Now add the flour mixture spoon by spoon to the whipped mixture and keep mixing it till all the flour is incorporated.
7. Add the milk into the batter and mix it well.
8. Now pour the batter in a pre-greased cake pans or muffin or cupcake moulds.
9. Place the cake, muffin or cupcake mould in the oven and bake at 160 °C for 30- 35 minute for cake, 18- 20 minutes for muffin or cup cake.
10. To check if the cake is baked properly, insert a tooth pick into the cake. After 10 seconds take out the tooth pick and check if the tooth pick comes out clean the cake is done and if it has a sticky surface then the cake needs to be baked more.

Important consideration in baking a batter

Different cake batters are baked for different time and temperature depending upon their volume and density. High volume batter are baked at low temperatures for a longer time whereas low volume of batter is baked at higher temperature for a lesser time. Similarly, high density batter are baked at low temperatures for a longer time whereas low density batter are baked at high temperature for a lesser time.

Let us understand this concept with the help of examples. Sponge cake sheet batter in a large tray is baked at a high temperature of 200- 220 °C for 10-12 minutes whereas the same sponge batter when poured in small cake moulds with more thickness of batter is baked at a low temperature of 170 °C for 20-25 minutes. Muffin batter which is dense is baked at a low temperature of 170 °C for 15-18 minutes.

Dough

The mixture of flour and liquid with other ingredients, such as leavening agents, shortening, sugar, salt, eggs, and various flavouring materials is called dough. It can be of soft to hard consistency to make various products like breads, biscuits, tarts etc. Most of the doughs are elastic in themselves. The types of doughs are classified on the basis of ingredients used, kind of product being made, type of leavening agent used, mixing method employed, and cooking or baking technique.

Fig.3.11: Dough

Types of dough on the basis of leavening agent

Out of the various factors which affect the type and class of dough, addition or absence of leavening agent is central to the development of typology of dough. The leavening agent or its absence plays a crucial role in the development of various types of doughs which are explained below:

Leavened or fermented doughs

These doughs are generally made by kneading flour, water and yeast together. Salt, oils or fats, sugars and milk are also used in such bread dough. Leavened dough is also called yeast dough or bread dough and is commonly used to prepare breads of various types. Flatbreads such as pita,

naan, matzo and tortilla are also made from this type of dough. Various types of dough such as soft rolled, hard roll dough, multigrain dough is prepared using leavened doughs. Soft rolled doughs have milk, butter and sugar and are baked at lower temperatures. Hard rolled dough are baked at higher temperatures to obtain hard crust.

Short crust dough

The doughs prepared with high fat and low water content develops short strands of gluten and are often called short crust dough. This dough is less elastic than yeast leavened dough. Examples of this type of dough are cookie dough, short crust pastry dough and pie crust doughs.

Quick breads dough:

These doughs use leavening agents other than yeast, i.e., baking powder or baking soda. These doughs are used for making cookies, cakes, biscuits etc.

Proofing

You must be wondering why the term proofing is used in bread making and what we are ultimately trying to prove. Historically, beer brewers in order to test the correctness and quality of the beer would prove this by mixing some of the beer into a small quantity of flour. If the mixture rose, they were happy and would treat this as a proof that the beer is rightly brewed. With the passage of time, allowing the dough to rise following the addition of yeast also came to be known as proofing. The term proofing therefore refers to any stage of fermentation. However, in bakery parlance, the term is used for the 'final rise' that takes place after the dough is shaped.

Once the dough is prepared, it is allowed to rest. During this resting period, the first fermentation i.e. first proofing takes place. After this stage, the dough is taken out of the proofing chamber and then knocked back on a flat surface and again kept for second fermentation i.e. second proofing. After second proofing the dough is finally knocked back on a flat surface. After this the dough is shaped as per the requirement and kept in the proofing chamber for final fermentation i.e. final proofing. After final proofing, the shaped dough is taken out from the proofing chamber and scored as shown in Fig. 3.12. The scored dough is then finally kept in pre heated oven for baking.

Fig. 3.12: Scoring finally proofed dough

Why proofing is essential?

Proofing is an essential step of bread making and other products like croissant that require creation of air pockets in the dough by the action of yeast. If the dough having yeast is not allowed to proof, the yeast cannot release carbon dioxide and the gluten in the dough will not be able to stretch enough to hold the gases. The different functions of proofing are shown in Fig. 3.13.

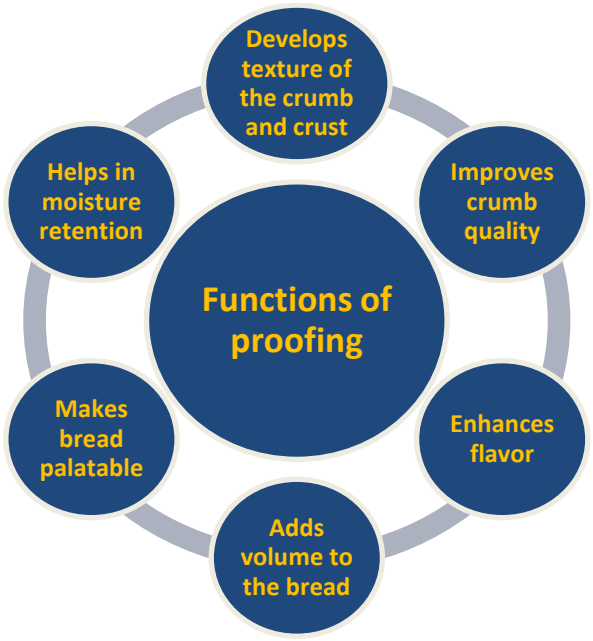

Fig. 3.13: Functions of proofing

Mistakes in proofing

How will you identify if the dough is under-proofed or over proofed? Over-proofing will result in more air pockets than the dough can structurally hold at the moment the dough is placed into the oven. The dough will deflate before the crust and crumb can set resulting in less volume and wrinkled product. Over-proofed dough is structurally weak and shakes like jelly. Under-proofed dough is dense with insufficient volume because the optimum structure has still not been developed in it. The under-proofed dough can be corrected by allowing it to ferment for more time. But it is very difficult to correct an over-proofed dough.

Finger poke test

The proper proofing of the dough can be tested by poking your finger gently in the dough. If the dough rebounds back slowly it is properly proofed. If the dough rebound backs immediately, the dough is under-proofed. If the dough does not rebound at all, it indicates that the dough is over-proofed.

Tips for successful proofing

1. The ideal temperature for proofing is around 28°C to 30°C. If the temperature is above 30 °C, the yeast will grow fast and not in tune with the desired gluten structure. Under such conditions, the gluten structure will not hold the air bubbles and collapse by itself. Never proof the dough above 45°C. If the temperature for proofing is below 28°C, yeast will not multiply as desired. If proofing chamber is unavailable, surround the dough with sufficient insulation so that the heat produced during fermentation can be utilized to increase the temperature of the dough.
2. Always knead and shape the dough gently to avoid loss of air bubbles formed in the dough. Cover dough with a plastic bag or cloth during proofing to prevent the dough from drying out or forming a skin if not in a proving chamber.
3. Use proofing containers that allow dough to rise. They should be at least two or three times the size of the dough.
4. Keep hands and other surfaces slightly floured or greased to prevent sticking of dough.

Preparation of dough
Preparation of a Bread Dough

Here we are taking the example of preparation of white bread dough using planetary mixer. The recipe and step by step method of preparation of bread dough is given below:

White Bread Dough Recipe		
S. N.	**Ingredients**	**Quantity**
1.	Refined wheat flour	1000 gm
2.	Instant dry yeast	20 gm
3.	Sugar	25 gm
4.	Salt	20 gm
5.	Bread improver	01 gm
6.	Calcium propionate**	01 gm
7.	Vegetable oil	25 ml
8.	Water	580 ml

Method of Preparation

Pre-Preparation

Turn on the proofing chamber and set the temperature at 28 °C and humidity at 70%. If there is no proofing chamber then make an arrangement

to stack the bread dough moulds in a humid space where the bread will be kept for proofing. The dough however must be kept covered at all times to prevent it from drying.

Clean the mixing bowl of the planetary Mixer and attach a dough hook to it.

Dough Preparation

1. Measure all the ingredients one by one.
2. Measure water mixed with ice in a measuring jug. In Indian climate, it is important to keep the water ice chilled to prevent the dough from fermenting while kneading.
3. Pour the ice water in the mixer bowl then add all the ingredients except oil in the bowl of the planetary mixer.
4. Turn on the mixer and knead all the ingredients at slow speed (speed of 1) for 3 minutes.
5. Once all the ingredients are mixed, increase the speed to medium (speed of 2) and knead the dough for 3-4 minutes till it is soft and elastic.
6. Now add the oil and knead again for 3 minutes at medium speed to make soft and elastic dough.
7. At this stage the dough does not stick to the sides and bottom of the bowl. To test if the dough is ready, pull out a small piece of it so and note if it spreads like a thin sheet or not. If the sheet does not break, the dough is ready for proofing. If the sheet breaks, then knead the dough again for 2 minutes.
8. Place the bulk dough on the working surface. Fold the dough towards the inside by pulling the edges and bringing it into the center, shape it like a ball. Cover it with a wet cloth or plastic sheet and let it bench rest for 15 minutes.
9. Cut and divide the dough into 4 equal parts each weighing 418 gm.
10. Fold each piece of the dough towards inside and shape it like a ball. Cover the dough pieces and give them another bench rest for 15 minutes.
11. Now, knock back each dough piece with the back of the palm to remove gases and flatten the dough.
12. Roll the flattened dough towards inside ensuring the roll is tight and firm and shape it like a cylinder.
13. Seal the joints of the dough by pinching.
14. Meanwhile grease bread moulds.
15. Put the dough in the greased bread mould. Place the lid on top and leave it slightly open to allow exit of extra gases.
16. Place the dough in proofing chamber for 1– 1.5 hour. Once the dough has nearly doubled in size in the mould, close the lid of the mould.

Meanwhile, approximately 15 minutes before the expected completion of proofing, pre-heat the oven to 160 °C.

17. Place the moulds with the proofed dough on a baking tray and place this into the oven. Bake at 160 °C for 35-40 minutes if the oven is convection type and at 200 °C for 30 minutes if it is deck oven.
18. Take out the baked bread and allow it to cool for at least 1 hours before slicing.

Conclusion

Preparation of the desired batters and doughs is the first step in bakery. The module discusses the important methods of batter preparation i.e. creaming, method, whipping method and all-in-one method with the example of preparation of batter for cakes and important considerations during baking of the batter. Similarly, dough is discussed along with the typology of doughs on the basis of leavening agents. For a dough to be fit for baking it has to be first proofed. Therefore, the essentiality of proofing and common mistakes in proofing are elaborately discussed in the session. The session gives a practical recipe for a dough along with detailed steps of preparing and baking so that you are able to form a composite view of batters and doughs and proofing vis-a-vis the doughs.

What have you learned?

After completing this Session, you are able to:

- prepare basic dough and batter
- describe types dough
- explain proofing and its importance in bread making

Practical Exercises

Activity

1. Prepare a dough and batter following steps given in the session. Identify and note down what are the differences you have observed in their steps of preparation and product outcome.
2. Prepare three bread dough, keep first dough in warm environment or room temperature, second dough in refrigeration and third dough in proofing chamber for 30 minutes. Observe and note down the changes in all three doughs. Also identify the under proofed and over proofed dough.
3. Prepare three bread dough and bake first dough at 140 °C for 35 minutes, second dough at 170 °C for 35 minutes and third dough at 200 °C. After baking allow to cool and once cooling is complete. Observe the changes occurred and identify half baked, baked and over baked products.

Check your progress

I. Multiple choice Questions

1. Batters literally means to..... vigorously.
   a. whip b. beat
   c. cream d. ferment
2. Cakes, muffins are prepared using .....
   a. batter b. paste
   c. dough d. none of the above
3. Solid fat or butter is softened into a smooth mass of cream and blended with sugar in ..... method.
   a. shortening b. creaming
   c. fermentation d. proofing
4. Smaller sugar crystals yield .....quantity of small air pockets.
   a. smaller b. bulky
   c. larger d. few
5. Batter rises double in volume when whipped due to the .....
   a. aeration b. mixing
   c. fermentation d. shortening

II. Mark the statement True or False.

1. Batter is a mixture of flour and liquid with other ingredients.
2. In whipping method, sugar and butter are creamed together to form a homogenous mixture.
3. Sponge cakes are made using whipping method.
4. High volume and high-density batter will be baked at low temperature for a longer time.
5. Finger poke test is used to check the consistency of batter.

III.Fill in the blanks:

1. _____ refer to any stage of fermentation.
2. Leavened dough, _____ and quick bread dough are types of dough.
3. In reference to baking, _____ rise , refers to proofing.
4. The ideal environment for a proof is around, _____ with humidity 0f 70 %.
5. Never proof the dough above temperature of.....°C.

IV. Short answer type questions

1. What is proofing.
2. Describe the process of proofing.
3. What are the advantages of proofing the dough?
4. Describe batter and dough.

SESSION 4: COOLING, PACKAGINING AND STORING

After the bakery product has been made the next steps are to cool, package and store it. This is carried out to the highest standard of food safety to prevent contamination and faster deterioration of the baked products. After cooling, the products are sliced as per the requirement of the product. Breads and tea cakes are cooled, sliced, packed and then stored. Pastries and whole cakes are cooled and suitably stored using appropriate packaging.

Cooling

Cooling is done to control growth of mold and bacteria in the baked product. After the product has been properly cooled, the extra moisture which is in the form of steam before cooling, now escapes from the products which in turn helps in stabilizing the textures of the product. After the product has thoroughly cooled, it is easier to slice it properly in desired size and shape.

Important considerations in cooling

For cooling of the most of the bakery goods, a cooling rack or wired rack is used which allows air to circulate completely around the baked item placed on it. The baking tin or sheet is directly placed on to the racks for initial cooling phase. After initial cooling, the baked goods are then transferred directly onto the cooling rack.

Fig. 3.14: Wired rack

Other important considerations while cooling the different types of bakery products are as follows:

1. Do not cool bread in cold air environment to avoid cracking of the crust of the bread.
2. If soft crusts are desired, breads are brushed with melted shortening or oil before cooling.
3. Small bread rolls, buns and muffins baked on baking sheets in small batches are generally cooled on the same trays. They must be cooled where adequate air circulation is available.
4. If the batch size of the product is large and gap between each item is less, then due to condensation upon cooling, the bottoms and sides of the product is likely to become soggy. Therefore, such products are cooled on cooling racks or grills for quicker cooling action.

5. Small rolls or cakes that are to be consumed immediately after baking as warm food are not packed. But if packaging is required then they are properly cooled before packaging.

Packaging

Packaging delays growth of bacteria and prevents contamination. Once cooling is done, the bakery product is either stored in a clean and air tight container or is packed with packaging material. From the packaging point of view the bakery products are divided into dry and moist categories. Under the dry category are included biscuits, cookies, crackers, cream wafer biscuits. etc. whereas bread, buns, cakes, pastries, muffins, doughnuts etc. are included under moist category.

Dry bakery products are brittle, crunchy and crispy in texture with low moisture content and are highly hygroscopic. Proper packaging of these products is required to maintain their texture, prevent breakage and rancidity development as well as prevent entry of any off-smell. Moist bakery products have higher moisture content, delicate structure and texture. Therefore, in the packaging of moist bakery products, the prime aim is to provide a moisture barrier which prevents moisture loss of the product, as well as stops outside moisture from entering to the product so that the freshness and shape of the product is maintained.

The broad considerations for packaging materials of bakery products are as follows:

1. Prevent moisture evaporation, contact with outside atmosphere and minimize deterioration of aroma.
2. Packaging material are impervious to fats and oils contained in the products.
3. The packaging material are printable, presentable and eco-friendly. Detailed information about the product such as composition of the product, nutritional value, price information etc must be provided on pack.
4. Prevent absorption of undesirable off-flavours from surroundings.
5. Protect shape of the bakery product and have convenient packet opening facilities

Packaging of biscuit

Biscuit being a dry and brittle bakery product is highly susceptible to breaking during transport and retail handling. The packaging material must provide mechanical protection to the biscuits. This is achieved by adopting flexible plastic pouches for biscuits which restrict the contact with the

external environment. Biscuits are generally packed in wrappers or pre-formed pouches (Fig. 3.15). and plastic trays (Fig. 3.16). Widely use packaging materials are moisture-proof sealable transparent cellophane, coated cellophane, low density polyethylene (LDP), polypropylene (PP), polyester, polyethylene film and poly vinyl chloride (PVC).

Fig. 3.15: Pre-formed pouches for biscuit packaging packaging.

Fig. 3.16: Plastic tray for biscuit

Packaging of breads

Now-a-days nearly 80% of all bread is packed in plastics films such as LDPE, LLDPE-LDPE and PP. LLDPE or LDPE bags of 1 to 1.5 mm thickness secured by plastic clip or twisted wire ties are used for packaging of breads. End fold wrapping and pillow pack wrapping are the most common style of packaging adopted for breads and biscuits.

Fig. 3.17: Bread packed in end-fold style

Storage

Good packaging prevents spoilage of baked goods whereas storing it at the right place and temperature ensure its extended shelf life. Packaging includes instructions about how and where the products are to be stored. After packaging the product, it is stored either at room temperature in a cool and dry place or refrigerated or frozen.

Storage of moist bakery products

The majority of moist bakery products are sold fresh and stored at ambient temperature. Moist bakery products such as tea cakes, muffins, cupcakes are stored under refrigeration (2-5 °C).

In drier or hotter climates, staling of bread is much faster. Therefore, the bread is stored in a

Why bread is sometimes deep frozen?

Deep freezing of bread is used to maintain freshness for longer duration. Refrigeration speeds up the re-crystallization of starches in bread, whereas freezing stops re-crystallization of starches. Water moves within the

cool and dry place away from the sunlight. Breads containing fewer preservatives quickly become stale as compared to breads with more preservatives. Therefore, such breads are to be consumed as soon as possible.

Bread is seldom stored in refrigerator because the moisture in the bread is lost, making the bread dry. Breads can be stored in deep freeze, if it is not to be consumed immediately or within 2-3 days. By deep freezing, the freshness of the bread can be preserved for up-to 12-14 days. The frozen bread will spring back to original form when either heated in the oven for 10 to 15 minutes at 180 °C for whole loaves or kept at room temperature for half an hour for sliced bread. The heat causes the movement of water in the bread again.

Storage of dry bakery products

Biscuits and other dry bakery products such as crackers, cream wafer are stored at room temperature in a cool and dry place away from direct sun light and heat. They are stacked in firm cartons and crates for easy transportation and to save them from physical damage. If preservatives are used, the dry bakery products can be stored at room conditions up to 6 months easily with proper packaging.

Conclusion

The session discusses the importance of proper cooling of baked products along with important considerations in cooling. Bakery products require items of different packaging requirements, which are met by a range of plastic materials in the form of films, laminates and trays etc. These materials provide adequate protection against loss or gain of moisture, retain the taste and aroma, and are hygienic and safe for food contact. Other additional properties such as printability and cost effectiveness make these items the ideal choice for packaging. The session discusses the salient points of storage of dry and moist bakery products.

What have you learned?

After completing this Session, you are able to:

- discuss the important considerations for cooling bakery products
- describe quality parameters of packaging materials for dry and moist bakery products
- explain the objective of packaging and storing bakery products

Practical Exercises

Activity

1. Demonstrate cooling, packing and storage process of bread.
2. Collect few samples of packaging materials used for commercially available bakery products.
3. Store samples of bread in freezer as well as in refrigerator for 7 days. Observe and note down and discuss the changes occurred in both the bread samples along with reason.

Check Your Progress

I. Multiple choice Questions

1. Proper cooling is required to allow the escape of extra ..... which is in the form of steam in products.
   a. air b. moisture
   c. heat d. odour
2. ..... is used for cooling of the products.
   a. wired rack b. flat trays
   c. mould d. baking tin
3. Cooling bread in cold environment may cause .....
   a. cracking of the crust b. sogginess
   c. dense crumb d. destabilisation of bread structure
4. Flour with low protein content is suitable for production of .....
   a. bread b. roti
   c. cookies and biscuit d. cake flour

II. Mark the statement TRUE or FALSE:

1. Nutritional value is mentioned on packaging.
2. Breads can be stored in frozen form for longer period.
3. Wired rack is used for packaging.
4. Packaging delays staling, growth of bacteria and prevents contamination.

III. Fill in the blanks

1. Cooling, packaging and storing are three essential ..... steps.
2. ..... of the products is done to inform the consumer about the ingredients, nutritional value, batch no, etc. of the product.
3. Dry bakery product and ..... are two categories of bakery products from the packaging point of view.
4. Packaging should provide ..... barrier.

IV. Short answer type questions

1. Write important considerations for cooling bakery products.
2. List down categories of bakery products from the packaging point of view.
3. What are the quality parameters of packaging materials for dry bakery products?
4. What are the quality parameters of packaging materials for moist bakery products?
5. How will you preserve the quality of bread?

Module 4 Documentation and Record Keeping

INTRODUCTION

Documentation and record keeping in a bakery is one of most important responsibility of a Baking Technician. In this module, we will learn about the different types of documentation and record keeping which are carried out in a bakery. You will also learn about the usefulness of enterprise resource planning (ERP) as a tool for this purpose.

Various activities like purchase, sales and production records are required to be documented in a bakery on a continuous basis. Record keeping is a key to success in bakery.

The systematic arrangement of different types of documentation is called record keeping. This is a continuous process. The different types of documents and records are maintained in a clear language and kept properly for quick access. The documents and records can be maintained in both register form or digital form.

The advantages of a system of documentation and record keeping include minimization of the misuse and misplacement of raw materials and finished product. Thus, the system of documentation and record keeping adopted by the bakery reduces its unnecessary wastages and losses.

The various aspects of a bakery module which are covered under a system of documentation and record keeping are shown in Fig. 4.1

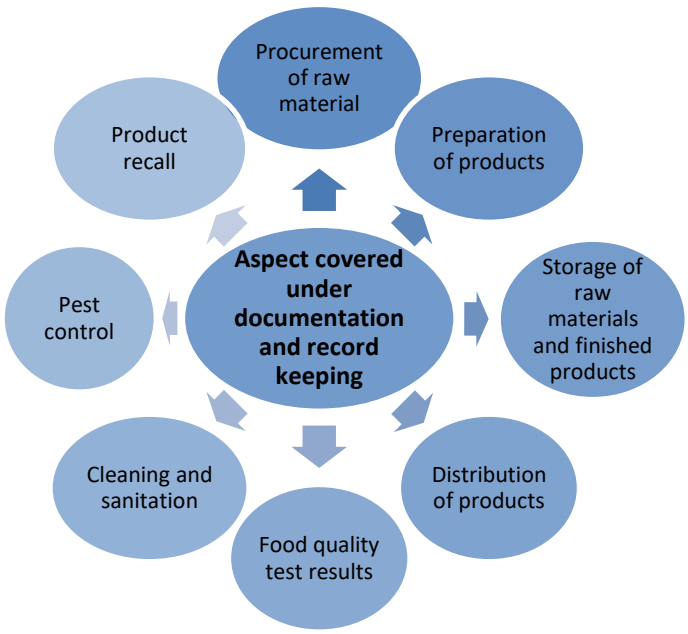

Fig. 4.1: Aspect covered under documentation and record keeping

The system helps in periodic audit of the various aspects covered above.

Types Of Records

The Baking Technician is required to document and maintain records on the following aspects:

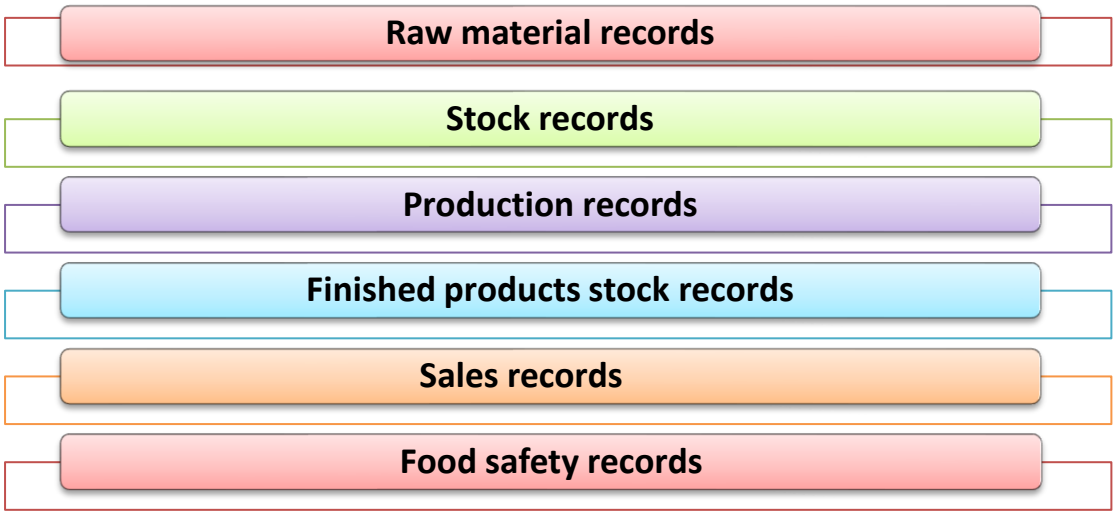

Fig. 4.2: Types of records maintained in a bakery

Let us discuss various types of operational records in detail:

Raw material records

These records include all the activities performed beginning from the purchase of the raw material till receiving and maintain the inventory. The raw material record includes the record of purchases and receipt of ordered amount of goods. The usual format of the purchase and receipt record is discussed below:

Purchase records format

The procedure of purchase begins with issue of a purchase order to the vendor indicating the quantity and quality of the raw material to be purchased. The in-charge of the stores department prepares the standard purchase specification (SPS) order on the basis of the stock in hand. A sample SPS order is given in Fig. 4.3.

Specimen of Standard purchase specifications/ purchase order

S. No.	Ingredients	Brand	Standard weight	Standard size	Color	Shelf life	Nutritional profile	Cost
1	Refined wheat	XYZ co.	25 kg bag	-	Unbleached, white	3 months	Protein content 6-	Rs. 29/kg

	flour						8 %	
2	Butter	PQR co.	1 kg block	4 inches x 6 inches	Pale yellow	Minimum 6 months	Unsalted Fat content 80 %	Rs. 400/kg
3	Castor Sugar	ABC Co.	1 kg packets	0.1 mm size of granule	White	Minimum6 months	Sulphur free	
	Prepared by: Approved by: Date:							

Fig. 4.3: Specimen of SPS order

Receipt record format

This format is used for entering raw material received on the basis of purchase orders and invoices. The raw material is inspected for quantity, quality and defects as per the SPS order. If any defect or deficiencies are found, the same is informed to the supervisor for immediate rectification. A specimen for the receipt record is given in Fig. 4.4.

Specimen of receiving record format						
Date	Raw material ordered	Quantity	Vendor	Invoice no	Received by	Remark
Verified By:						

Fig. 4.4: Specimen of SPS order

Stock record

The requirements of indent are met from the stock in-hand record. Indents are also known as requisition. An indent is the list of raw ingredients and supplies required by the baker for carrying day to day operation. Records of the indented materials are maintained by the stores department through the issue register. The stock with the bakery unit are tracked through perpetual and physical inventory. The difference between perpetual and physical inventory is that the perpetual inventory continuously records items as and when they are added to or subtracted from this inventory whereas physical inventory uses a periodic schedule, usually fortnightly or monthly. The usual format of the indent, perpetual inventory and physical inventory are discussed below:

Indent form

A baker should enter the required ingredients and other materials in the indent form on a daily basis and forward it to the stores department for

issue of the indented material. The storekeeper issues the materials as per the indent on the desired date. This record is maintained on a day to day basis. A specimen of indent is given in Fig 4.5.

Specimen of Indent					
S.no	Items	Quantity Ordered	Specification	Issued	Remark
Date of indent:		Required on:			
Indented by		Approved by:			
Received by:		Issued by:			
Date and time:		Date and time:			

Fig. 4.5: Specimen of indent

Perpetual inventory

The perpetual inventory is also called stock register. The specimen of perpetual inventory is shown in Fig. 4.6.

Specimen of perpetual inventory Date.....							
S.no	Item	Maximum par stock	Minimum par stock	Opening Stock	Stock received	Stock used	Balance
1	Castor sugar						
2	Grain sugar						
3	Flour refined						
4	Flour whole wheat						

Fig. 4.6: Specimen of perpetual inventory

Physical inventory

It is the periodic physical count of various types of items used in the bakery unit. The physical inventory also serves as a verification and checking of perpetual inventory records. If there are differences between them, it is looked into. A printed list of all inventory items is issued. After the physical count and verification of each item, the quantity is updated in the list. The specimen of physical inventory is shown in Fig. 4.7.

Specimen of physical inventory **Date.....**					
S.no	Item	Opening Stock (closing stock of previous month)	Stock received	Stock consumed	Stock in-hand
1	Castor Sugar				
2	Grain Sugar				
3	Flour refined				
4	Flour whole wheat				

Fig. 4.7: Specimen of physical inventory

Production records

Records of production scheduling and daily production are covered under production records and are discussed below:

Production schedule

The amount of each bakery item to be prepared, time of preparation, expected and actual yield, and baker responsible for production are included in it. The specimen of production schedule is shown in Fig. 4.8.

Specimen of production schedule					
Product name:_____ Assigned to: _____:_____			Assigned by: _____ Scheduled date		
Recipe	Stock in-hand	Expected yield of product	Actual yield of product	Time schedule	Comments
Additional instructions:					

Fig. 4.8: Specimen of production schedule

Production record

The daily records of food or bakery items produced are maintained here. The specimen of a production record is given in Fig. 4.9.

Specimen of Daily production record for ----------(date)						
Product	Recipe no.	Weight of raw product	Weight of the finished product	Packaging units of finished goods (number)	Name of baker	Batch no.
Bread	1	5 kg	6 kg	400gm x 15 pack	XYZ....	0032
Cookies	5	5 kg	4.5 kg	100 g x 45 pack	ACD....	0035
Cake	4	5 kg	4.5 kg	450 g x 10 sponges	YZX.....	0041
Shift Supervisor:			Production Manager /Chef In charge:			

Fig 4.9: Specimen of daily production record

Finished product stock record

The quantities of every finished products issued daily to vendors along with the sale price is included in this record (Fig. 4.10).

Specimen Finished product stock record Date:						
Product	Opening Stock	New production	Issue	Stock in hand	Rate	Remark
Bread						
Cookies						
Cake						
Shift Supervisor:					Outlet Manager /Chef In charge:	

Fig. 4.10: Specimen of finished product stock record

Sales record

The daily sales records of every produced product are maintained here (Fig. 4.11). In this register quantities of items sold, their rates and value of total sale are recorded daily.

Specimen Sales record for.....(Date)				
Product	Total quantity sold	Rate	Net Sales	Remarks
Bread				
Cookies				
Cake				
			Total sale	
Shift Supervisor:		Outlet Manager /Chef In charge:		

Fig. 4.11: Specimen of sales record

Food Safety records

Food safety records cover various types of records and checklist to ensure safe food handling and practices. Fig. 4.12 shows the types of food safety records.

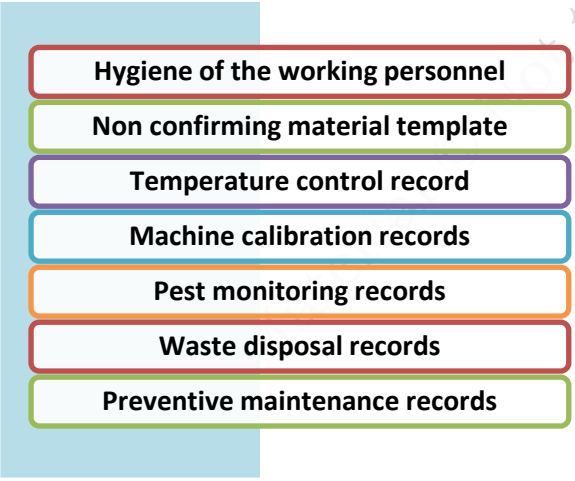

Fig. 4.12: Various food safety records maintained for a bakery

Enterprise Resource Planning (ERP)

The bakery industry relies on accuracy and safety to ensure product consistency and consumer well-being. Right tools are needed to ensure inventory management, recipe control, regulatory compliance, material management and planning functions properly. These functions can be easily carried with the help of enterprise resource planning (ERP) software which integrates multiple business functions into one program. Various benefits of using ERP in a bakery are illustrated in Fig. 4.13.

Fig. 4.13: Benefits of using ERP in a bakery

Operational uses of ERP

A bakery unit can profitably utilize the information and inference derived from the ERP for the following purposes:

1. Inventory management

Ingredients are ordered, stored, and accessed in the most efficient ways possible to lower inventory costs, wastage, and inventory write-offs.

2. Recipe control

Bakery operations need control over the formulas and recipes used in production. Recipe management ensures that products are consistently made and have the same quality levels in each batch. An ERP with strong recipe management capability allows for ease of scalability for recipes as needed.

3. Regulatory compliance

Management of various types of regulatory compliances is essential for a bakery. With an ERP, bakeries can use an array of tools to rectify key compliance issues like processes and procedures, sequencing, training of personnel etc. In case of a recall of products, ERP can help improve response times by easily tracing the recipes and batches.

4. Material requirements planning

Material requirement planning helps in optimizing the procurement of raw materials and inventory levels to reduce costs and waste. With an ERP, bakeries can create purchase orders based on projected demand, open production batches and monitor sales orders and forecasts.

5. Enhanced product sale

The ERP helps in improving the product sale via analysing the potential customers. Thus, the ERP for bakery industry helps in automating every task, bringing qualitative changes in product rotations and promoting personalized selling.

Conclusion

The net gain or loss is achieved by a bakery unit can only be assessed after a thorough analysis of documents and record of various types which are required to be maintained by a bakery unit. The session discusses the important types of records and how to maintain them along with the

usefulness of an enterprise resource planning approach for modern day bakery businesses.

Activity

1. Visit to any food industry/ bakery outlet for visual demonstration of record keeping and enterprise resource planning.
2. Create a sample of perpetual inventory and physical inventory.
3. Create a sample of finished product stock in hand and issue record format.
4. Visit to any food industry or commercial bakery to have visual demonstration

Check your progress

I. Multiple choice Questions

1. The systematic arrangement of different types of documents is called .....
   a. record activity b. record keeping
   c. documentation d. digitalization
2. SPS is used to order raw material on the basis of stock in hand and thus is a .....record format.
   a. receipt b. purchase
   c. stock d. sale
3. Indent also known as .. ..
   a. purchase b. sales record
   c. requisition d. inventory
4. The perpetual inventory is also called .....
   a. purchase b. sales record
   c. stock register d. inventory
5. Temperature control record is a ..... record
   a. finished product b. food safety
   c. food handling d. food quality

II. Mark the statement True or False

1. The physical inventory also serves as a check against perpetual inventory records.
2. Sales record covers the total sale of the products on daily basis.
3. Physical inventory sheet continuously records items as and when they are added to or subtracted to the store.
4. Records of issuing materials as per the indent on the desired date is maintained weekly basis.
5. Enterprise resource planning (ERP) software integrates multiple business functions into one program, from accounting to traceability.

III. Fill in the blanks

1. _____ is the list of raw ingredients and supplies required by bakery for their day to day operation.
2. A _____ record format is used for entering raw material received on the basis of purchase orders and invoices.
3. The requirements of indent are met from the _____ record.
4. _____ helps you optimize the procurement of raw materials and inventory levels to reduce costs and waste for the bakery operation.
5. ERP stands for_____

IV. Short answer type questions

1. Define 'Record keeping'.
2. What do you understand by 'standard purchase specification (SPS)?
3. Enlist the Food safety records for bakery unit?
5. What do you understand by ERP?

What have you learned?

After completing this Session, you are able to:

- discuss the importance of documentation and record keeping in a bakery
- describe the types of record formats used in a bakery
- assess the details to be documented at production schedule

GLOSSARY

Additives	Substance that is added to something in small amounts for a specific purpose.
Adulterant	Substances whose addition is undesirable and prohibited in the food
Adulteration	Adulterant this term refers to the substandard substitute of the native product. When it is added to native product, natural composition and quality of product is affected.
Allergenic	Edible products causing allergic reaction
Batter	Batter is thin dough that can be easily poured into a pan. Batter is used mainly for pancakes, light cakes, and as a coating for fried food
Compaction	Implementation of force on a product to make it dense/compact.
Conduction	The transfer of thermal energy through direct contact.
Contamination	Incorporation of any impurity or some other undesirable element that spoils, corrupts, infects, makes unfit
Convection	The transfer of thermal energy through the movement of air.
Enamelled	Coated or decorated (a metallic or hard object) with enamel
Fermentation	This is a process in which yeasts or bacteria convert carbohydrates to alcohol or organic acids.
Flavourings	Additives that are added in baked goods to enhance flavours and taste.
Hygiene	Keeping one self and things clean to prevent diseases and infection.
Incineration	Destruction of waste material by burning
Indent or requisition	The list of raw ingredients and supplies required
Inventory	The items which are available for sale or used to manufacture products for sale
Leavening	Substances used in doughs and batters that cause raising of dough or batters thus lightening and softening them
Miscellaneous	Different type of things or activities
perishable	Products storability is very low and decay rapidly.
Perpetual	Continuously for a long period of time without stopping
Proofing	Dough is allowed to rest and rise a before baking
Radiation	is the transfer of thermal energy through thermal emission
Rodents	Warm-blooded mammals with oversized front teeth causing great damage in and around. Example mice.
Shelf life	The length of time or duration for which food may be stored safe for human consumption
Shortening	Shortening is any fat that is a solid at room temperature and used to make crumbly pastry and other bakery food products
Sourdough	Sourdough means the dough of bread is made by the fermentation of dough using naturally occurring lactobacilli and yeast
Spoilage	Deterioration of food and other perishable goods
Toxins	Poisonous substance produced within living cells or organisms

ANSWER KEY

Module	Session		True or false	Fill in the blanks
Module 1	Session 1	1. 2-3 days 2. Animal 3. freshness of food 4. energy and protein	1 True 2 True 3 True 4 False 5 False	1 Shelf life 2 Plants, animals 3 Standard Purchase Specification 4 Standard Recipe
	Session 2	1. safe food 2. hazards 3. weevils, fly, worms 4. protein 5. anaphylaxis	1. False 2. True 3. False 4. true 5. False 6. False	1. Peanuts 2. Intentional 3. 60ºC 4. Hairs, Stones 5. biological
	Session 3	1. 1950 2. HACCP 3. hazard analysis 4. GMP 5. 5 P's	1. False 2. True 3. False 4. False 5. True	1. food chain 2. HACCP 3. critical limits 4. seven 5. processes
	Session 4	1. 1954 2. 1955 3. 1998 4. ISI 5. AGMARK	1.False 2. True 3. True 4. True 5.False	1. Food safety Standard authority of India 2. 1955 3. Meat Food Products 4. FSSAI
Module 2	Session 1	1. contamination 2. all of the above 3. food hygiene 4. Personal hygiene 5. 20	1.False 2.True 3. False. 4. False 5. True	1. lid 2. ventilation system 3. Cleaning in Place 4. First in first out

				5. First expire first out
	Session 2	1. all of the above 2. muscle injury 3. below 4. green 5. circle	1. False 2. True 3. False 4. True 5. True	1. Hazards 2. Mixer grinder 3. covered 4. Yellow 5. hot
	Session 3	1. bin liners 2. Physical 3. Composting 4. Vermi-compost	1. True 2. False 3. True 4. False 5. True	1. recycling 2. Foot 3. Metal, plastic 4. decompose 5. Land
Module 3	Session 1	1. SPS 2. Bread 3. Protein 4. cookies and biscuit 5. 1- 5 gm/kg	1. False 2. False 3. True 4. False 5. False	1. Fats and oil 2. Standard purchase specification 3. Gluten 4. Artificial flavouring agents 5. CO2 and ethanol
	Session 2	1. Hot 2. Radiation 3. Pizzas 4. Rotary 5. direct fired	1. False 2. True 3. True 4. False 5. False	1. Tandoor 2. Direct Fired Ovens 3. refractory 4. Conduction 5. carbon monoxide
	Session 3	1. beat 2. batter 3. creaming 4. larger 5. aeration	1. True 2. False 3. True 4. True 5. False	1. Proofing 2. Poolish 3. final 4. 28 °C 5. 45
	Session 4	1. Moisture 2. wired rack 3. cracking of the crust 4. cookies and	1. True 2. True 3. False 4. True	1. Post production 2. Labelling 3. Moist bakery products

		biscuit		4. Moisture
Module 4		1. record keeping 2. purchase 3. requisition 4. Stock register 5. food safety	1. True 2. True 3. False 4. False 5. True	1. Indent 2. Receipt 3. stock in-hand 4. Material requirement planning 5. enterprise resource planning

FIGURE CREDITS

Fig. 3.6: https://tinyurl.com/3w9v9ncn

Fig. 3.7: https://tinyurl.com/terc9hbh

Fig. 3.8: https://tinyurl.com/25xheeyv

Fig. 3.9: https://tinyurl.com/cj72zsrz

Fig. 3.10: https://tinyurl.com/fna79nes

Fig. 3.11: https://tinyurl.com/mzwdfx34

Fig. 3.12: https://tinyurl.com/yp5924hj

Fig. 3.14: https://tinyurl.com/c8z6awm8