Baking Technician

(Job Role)

Qualification Pack: Ref. Id. FIC/Q5005
Sector: Food Processing

Textbook for Class IX

17978

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NCERT

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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.

HRUSHIKESH SENAPATY
Director
National Council of Educational
Research and Training

New Delhi
September 2020

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:

1. FIC/N5017: Prepare and maintain work area and machineries for baking products in the oven.
2. FIC/N5018: Prepare for baking products in the oven.
3. FIC/N9001: Food safety, hygiene and sanitation for processing food products

The contents of the textbook have been divided into four units. Unit 1 gives an overview of the bakery sector. The categories of bakery products, various tools and equipment and ingredients used for the preparation of bakery products are also discussed in this unit.

Unit 2 deals with the preparation and maintenance of machineries and work area. The important practices of personal hygiene, cleanliness and sanitisation are further covered in this unit. Unit 3 deals with the practical aspects of food spoilage, types of microorganism, shelf life evaluation, handling and disposal of spoiled bakery products. Unit 4 describes in simple terms the essential mathematics used in bakery work, work plan for baking, various types of dough and the methods of their preparation.

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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We are also thankful to M/s Bhopal Baking Company (BBC), Bhopal, for providing the required photographs and preparing other visuals included in the textbook. The images have been selected with care and diligence for clearer understanding of learners. Care has been taken to not violate any copyright. Rest of the other images from various sources and included in the textbook, are covered under the provisions of their usage for educational purposes by students and teachers.

Blue Fish Designs Pvt. Ltd. is acknowledged for copyediting the manuscript and providing valuable inputs. Chanchal Chauhan, *Proofreader* (Contractual) of the Publication Division is acknowledged for proofreading the manuscript. The efforts of Pawan Kumar Barriar, *DTP Operator*, and Nitin Kumar Gupta, *DTP Operator* (Contractual), Publication Division, NCERT, for flawless layout design, are also acknowledged.

Contents

CHILDREN'S BILL OF RIGHTS

A child is every person under the age of 18 years. Parents have the primary responsibility for the upbringing and development of the child. The State shall respect and ensure the rights of the child.

Dignity and Expression

- I have the right to know about my Rights. *(Article 42)*
- I have rights being a child and no matter who I am where I live, what my parents do, what language I speak, what religion I follow, whether I am a boy or a girl, what culture I belong to, whether I am disabled, whether I am rich or poor. I should not be treated unfairly on any basis. Everyone has the responsibility to know this. (*Article 2)*

- I have the Right to express my views freely which should be taken seriously, and everyone has the Responsibility to listen to others. (*Article12,13)*
- I have the Right to make mistakes, and everyone has the Responsibility to accept we can learn from our mistakes. (*Article 28)*
- I have the Right to be included whatever my abilities, and everyone has the Responsibility to respect others for their differences. (*Article 23)*

Development

- I have the Right to a good education, and everyone has the Responsibility to encourage all children to go to school. (*Article 23, 28, 29)*
- I have the Right to good health care, and everyone has the Responsibility to help others get basic health care and safe water. (*Article 24)*
- I have the Right to be well fed, and everyone has the Responsibility to prevent people from starving. *(Article 24)*
- I have the Right to a clean environment, and everyone has the Responsibility not to pollute it. *(Article 29)*

- I have the Right to play and rest. (*Article 31)*

Care and Protection

- I have the Right to be loved and protected from harm and abuse, and everyone has the Responsibility to love and care for others. *(Article 19)*
- I have the Right to a family and a safe and comfortable home, and everyone has the Responsibility to make sure all children have a family and home. *(Article 9,27)*

- I have the Right to be proud of my heritage and beliefs, and everyone has the Responsibility to respect the culture and belief of others. *(Article 29,30)*
- I have the Right to live without violence (verbal, physical, emotional), and everyone has the Responsibility not to be violent to others. (*Article 28,37)*
- I have the Right to be protected from economic exploitation and sexual exploitation, and everyone has the Responsibility to ensure that no child is forced to work and is given a free and secure environment. (*Article 32,34)*

- I have the Right to protection from any kind of exploitation and everyone has the Responsibility to ensure that I am not being subjected to be taken advantage in any manner. (*Article 36)*

IN ALL ACTION CONCERNING CHILDREN, THE BEST INTERESTS OF THE CHILD SHALL BE A PRIMARY CONSIDERATION

All these rights and responsibilities are enshrined in the United Nations Convention on the Rights of the Child, 1989. It contains all the rights which children have all over the world. The Government of India signed this document in 1992.

Source: National Commission for Protection of Child Rights (NCPCR), Government of India

Overview of the Bakery Sector

17978CH01

You must have seen bakery shops in the market, do you know what they prepare and how? You must have eaten biscuits, different kinds of bread, cakes and cookies, these all are prepared by a cooking method known as baking. This Unit will enable you to understand the basic concepts of the shop known for preparing food items using this process. This shop is called a bakery.

You will be perhaps surprised to learn that baking is an industry in itself and has a wide scope and market.

Session 1: Baking Process and Categories of Bakery Products

Baking is the method of cooking food (dough, pastry or batter) by dry heat without direct exposure to flame typically in a cooking equipment called an oven. In baking process, the action of heat is modified by steam on the products to be baked. Baking is done in an oven, but some traditional foods are baked in hot ashes and on hot stones too. During baking, heat produced from the surrounding hot air and heated surface travels to the core of the dough or batter and causes moisture evaporation. This process converts the batter or dough into firm dry crust and soft centre baked item. As the

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dough pieces enter the oven, their surface temperature begins to increase and heat transfers slowly towards the core of the product. Expansion of the dough followed by drying of the surface and crust browning are the three stages of the baking process. During these three stages of baking, several reactions such as gelatinisation of the flour starch, caramelisation of sugar, water evaporation results in desired volume, texture, flavour and appearance of the product. Temperature and time for baking is specific for each product.

Categories of Bakery Products

Bakery products are an integral part of daily life in many parts of the world. Right from morning breakfast to dinner, bakery products are used everyday. Now you must be wondering if the bakery items can be categorised.

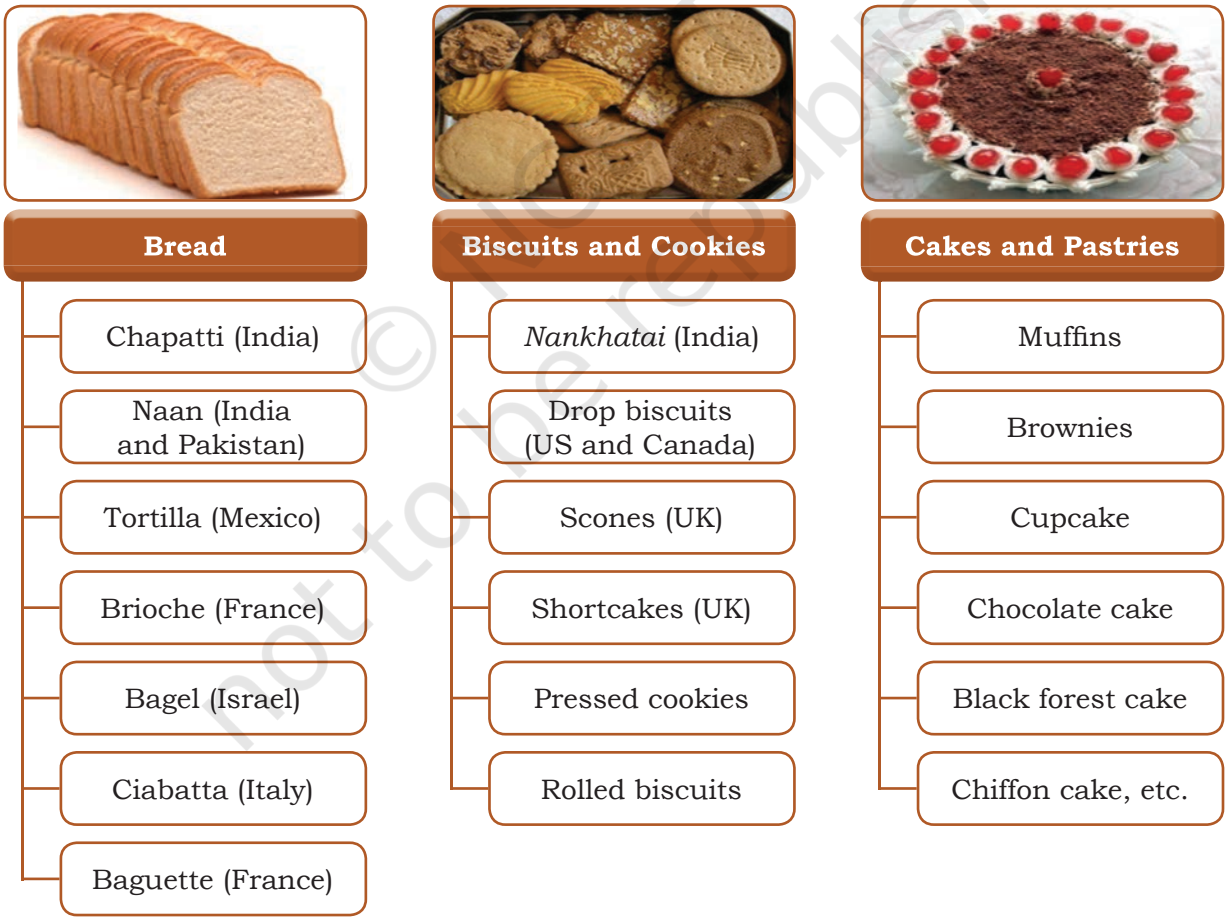


Fig. 1.1: Categories of bakery products

Bakery items are classified into three major categories:

(i) Bread: It is the second most consumed bakery product in India, after biscuits and cookies. Buns, doughnuts, etc., come under this category.

(ii) Biscuits: Biscuits are small baked products, one of the most loved food products for every age group. *Nankhatai*, cookies, crackers, etc., are similar products.

(iii) Cakes and Pastries: A birthday celebration is incomplete without cake. Sponge cake, cup-cake, carrot cake, Angel cake are some of the varieties. There are different varieties of cakes available in the market.

Overview of Bakery Industry

Baking has been a form of cooking since the ancient times of using hot stones and has evolved into an art form globally to now, in the modern era of baking in automatic electric and gas ovens.

Fig. 1.2: Traditional baking oven

Fig. 1.3: Modern domestic baking oven

Bread baking began in Ancient Greece around 600 BC. Baking is believed to be introduced by Egyptians around 2600 BC. They used to prepare bread using wild wheat, wild barley, sugar and water. The modern Indian chapattis, made from unleavened whole wheat flour, and Mexican tortillas, made from corn, resemble the older generation of breads.*

Fig. 1.4: Bread preparation during ancient days

*https://tinyurl.com/c5365fea

Fun Facts

- The word 'cookie' comes from the Dutch word '*koekje*', which means little cake and was used by North Americans in early years of 18th century.
- Today's biscuits once used to be called 'Biscotti'. The name 'biscotti' is derived from 'bis' meaning twice and 'cotto' meaning baked or cooked in Italian.

(https://tinyurl.com/45k5mn2m)

- Baking powder and baking soda were invented in 18th century, before that yeast and eggs were used to prepare cake.

https://tinyurl.com/f55bddj4

The demand of bakery products like readymade breads, patties, biscuits, pizza, etc., is increasing day-by-day because of their easy availability, convenient handling and busy lifestyle of people. Development of high-tech automated machines has made the baking process efficient, easier and added value to the bakery products.

Overview of Indian Baked Products

India is among the top producers of wheat, rice and other cereals, which are the primary ingredients for bakery products. Baking process has been a crucial part of the ancient Indian kitchen. Baking imparts a unique taste, texture and flavour to the baked products. Indian traditional style baking involves *chulha*, *bhatti* and tandoors for the preparation of traditional items like naan, roti, *kulcha, baati, litti,* baked potatoes, etc.

Fig. 1.5: Nankhatai

Fig. 1.6: Baati

Fig. 1.7: Litti

Advantages of Baking over other Cooking Methods

Various methods of cooking are roasting, frying, grilling and pressure cooking. Baking has many advantages over these cooking methods.

(i) Baking offers a variety of taste and textures with the use of few simple ingredients.

(ii) Bakery extends the storage life of products like biscuits and cookies due to less water or moisture content.

(iii) The baking process retains most of the nutrients thus offers nutritive choices to consumers.

(iv) It requires minimum basic types of equipment, thus less expensive in comparison to other food businesses.

Roles and Responsibilities of a Baking Technician

A Baking Technician is responsible for baking of products, maintaining their consistency and quality, while meeting the defined Standard Operating Procedures (SOPs) and leveraging their skills to operate ovens in synchronisation with proof box and rest of the unit. A Baking Technician also assists a Craft Baker and Plant Baker in day-to-day operations of the bakery plant.

The main duties and responsibilities of a Baking Technician include:

(i) Preparing dough and placing it into the pans or sheets to keep into the oven for baking
(ii) Gathering ingredients to measure and mix them.
(iii) Prepare baked products conforming to all the quality standards as per the standard operating procedures
(iv) Operate oven, plant and machineries and equipment in synchronisation with the proofing process
(v) Prepare and maintain the work area, machineries and tools
(vi) Plan production, equipment utilisation and manpower
(vii) Post production cleaning and regular maintenance of equipment
(viii) Follow and maintain food safety and hygiene in the work environment

A Craft Baker produces baked products such as, breads, puffs, cookies, cakes, pastries, desserts, etc., in artisan bakeries and patisseries.

A Plant Baker produces and supervises the production of baked products in industrial units by various methods using various industrial equipment.

Check Your Progress

A. Multiple Choice Questions

1. Baking is the method of cooking food by _____ in an oven.
   (a) dry heat (b) moist heat
   (c) frying (d) roasting
2. Which is not a baked item?
   (a) Bread (b) French fries
   (c) Biscuit (d) Cake

3. Baking is believed to be introduced by _____ around 2600 BC.
   (a) French (b) Egyptians
   (c) European (d) None of the above
4. The three major categories of baked items include bread, biscuit or cookies and _____.
   (a) french fries (b) cakes and pastries
   (c) chocolates (d) All of the above
5. Mexican tortillas are made from_____.
   (a) eggs (b) corn
   (c) sugar (d) All of the above

B. Mark the statement True or False

1. In the baking process, action of heat is modified by steam on food products.
2. The word 'Cookie' was used by North Americans for little cake.
3. Tortilla is a kind of staple bread from France.
4. Keeping the preparation area clean is the duty of a Baking Technician.
5. Brownie is a version of cake.

C. Fill in the blanks

1. Naan, roti and kulcha are traditionally baked in _____ and *bhatti*.
2. Bakery extends the _____ of products like biscuits and cookies.
3. The chapattis are made from _____ dough of whole wheat flour.
4. The term 'Biscotti' has originated from _____.
5. Baguette is a kind of _____ bread.

D. Short answer type questions

1. Enlist the various types of cake and pastry products.
2. Name the different type of cooking methods. How is baking different from these?
3. What is the role of a Baking Technician?
4. Name any five products made by baking.

Session 2: Tools and Equipment used in a Bakery Unit

The baking process requires various types of equipment, utensils and tools. The design and size of equipment depends upon the volume of sales expected.

In this session, we shall describe about various tools and equipment used in bakery. Here is the list of items used to prepare biscuit, cakes, pastry and other bakery products.

Tools Used in Baking

Different baking processes need specific bakery tools for optimum and desired quality of the finished product. Some of the basic tools and equipment are explained below.

Baking Tools	Equipment	Utensils
• Measuring spoons, cups and glasses • Whisks • Spatulas and brushes • Bench scraper • Dough scraper • Mixing spoons • Flour duster • Flour sifter • Parchment paper • Pastry bags • Decorating nozzles • Rolling pin • Knife and Cutters • Cake stand	• Refrigerator • Gas burners • Food processor • Electric blenders • Oven • Proving chamber • Dough mixer or kneader • Dough sheeter • Blow torch • Sugar mill • Mixer and grinder • Weighing scales	• Pans • Trays • Moulds • Baking sheet • Wire cooling rack • Working tables

Fig. 1.8: Basic baking tools, equipment and utensils

Fig. 1.9: Layer cake pan

Pans, trays and moulds

These are the fundamental tools for baking. Variety of pans, trays and moulds of all sizes and materials are used to give desirable shapes and design to the cake, biscuit, cookie and breads. Heavy-duty, silver-coloured tins have a tendency to absorb heat and cook to a desired colour and texture of a product.

Layer Cake Pans

Layer cake pans are used in preparation of traditional layer cake recipes where layering is done in cakes. These pans are usually 8 or 9 inches in diameter and atleast 2 inches deep to prevent overflow of the batter.

Fig. 1.10: Layered cake

Loaf Pans

Loaf pans are used in preparation of bread. An ideal size of pan for larger loaves is 9 × 5 × 2 inch and 8 × 4 × 2 inch for smaller loaves. Pans made up of iron or tin are dark in colour and utilised for crusty dark coloured breads, whereas pans made up of aluminium are suitable for light coloured breads. Nowadays, non-stick pans are used to ensure easy release of the bread loaf.

Fig. 1.11: Bread loaf Pan

Muffin Pans

Muffin pans are used to bake muffins, cupcakes and brownies. It is usually made up of metal or silicone, rectangular in shape. Standard muffin pans have six or twelve chambers measuring about 2 inches at the top and 1 inch deep. Mini, standard, and jumbo sizes are commonly available.

Fig. 1.12: Silicone muffin pan

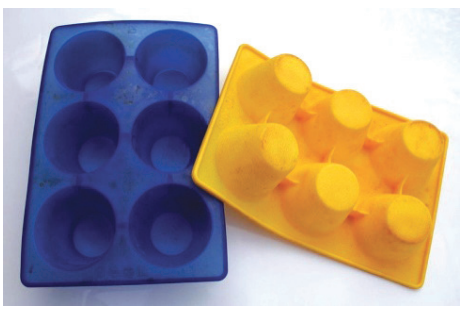


Fig. 1.13: Metal muffin baking pan

Baking cups

Baking cups are made of paper or foil or reusable silicone and are used to line muffin or cupcake pans. The baking cups hold the batter making it easy to release the baked cakes from the pan.

Fig. 1.14: Silicone baking cups

Spring Form Pans

Spring form pans have openable sides which are secured with a clamp. They are round in shape and have a removable bottom. Delicate cakes that could be damaged by turning them upside down while removing them from the pan are prepared using spring form pans. Sides of the pan expand and release the bottom, when clamp is opened to take out the baked cake.

Fig. 1.15: Spring form pans

Fig. 1.16: Opening spring of the pan

Square Baking Pans

Square baking pan is used for small cakes, brownies and bar cookies. The pan size has to be at least 8 inches and 2 to 3 inches deep to prevent overflow of batter.

Fig. 1.17: Square baking pans

Angel Food Cake Pans

Angel food cake pan is tall, round and has a tube up in the centre. The tube

The cake was named as Angel food cake because of its texture which was so light that even angels could eat it and still fly without being weighed down.

(https://tinyurl.com/rwhbfp5t)

up structure imparts the hole in the middle of the cake. These pans are used to bake angel food cake. The pans are kept ungreased to allow the cake to raise high. This pan is also known as bundt pan and tube pan. These pans resemble savarin mould which is hollow.

Fig. 1.18: Angel food cake pan

Fig. 1.19: Angel food cake in bundt pan

Fig. 1.20: Baking sheet

Fig. 1.21: Cookie sheet

Fig. 1.22: Measuring spoons

Baking sheets

Baking sheet is like a tray and has raised edges all around. It is made of iron, tin or heavy-duty aluminium and can be used for baking cookies as well as toasting nuts.

Cookie sheets

A cookie sheet is a flat metal sheet, rimless, designed for placing rows of cookies. A light-coloured heavy-duty aluminium baking sheet retains heat better and encourages even baking.

Measuring spoons

Small quantity of ingredients is measured using measuring spoons. Salt, baking powder, baking soda, lemon juice, yeast, spices and leaveners are required in small quantities and are measured accurately using measuring spoons. Generally, a measuring spoon set consists of 6 small spoons of varying sizes of ⅛ teaspoon, ¼ teaspoon, ½ teaspoon, 1 teaspoon, ½ tablespoon and 1 tablespoon.

Measuring cups and measuring glass

Flour, sugar, cream, butter, etc., are generally measured using measuring cups and measuring jar. A set of measuring cups includes sizes of ¼ cup, ⅓ cup, ½ cup and 1 cup.

Measuring glass is used for measuring liquid ingredient.

Fig. 1.23: Measuring glass

Fig. 1.24: Measuring cup

Fig. 1.25: Whiskers

Whiskers

Whiskers are used to beat eggs, creaming, folding and stirring together wet and dry ingredients. They give volume by aerating foods in cake making.

Spatula

Spatulas are used for scraping the dough and batter from the sides and bottom of the mixing bowl. They are also used for folding the ingredients and spreading the fillings.

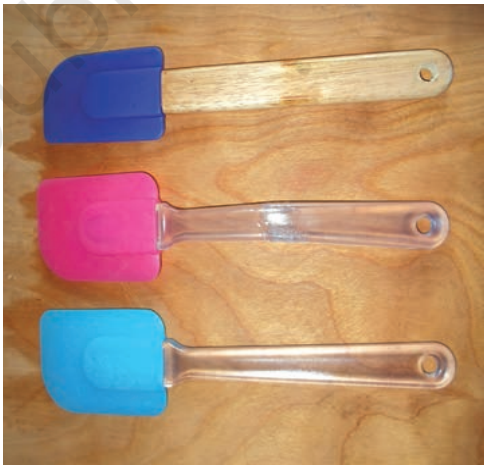


Fig. 1.26: Spatula

Bench scraper

Bench scraper has a straight edge and is marked with measurement markings. Its functions are given in Figure 1.28.

Fig. 1.28: Functions of bench scraper

Fig. 1.27: Bench Scraper

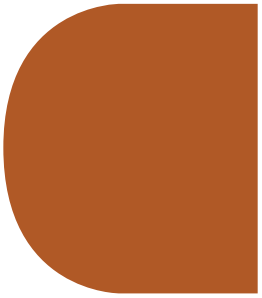


Fig. 1.29: Dough scraper

Dough scraper

Dough scraper has a rounded edge at one side and flat edge on the other side. The round edge is useful for scraping dough, batter, and cream out of a utensil whereas flat edge is used for levelling the batter in pan and cleaning the work surface.

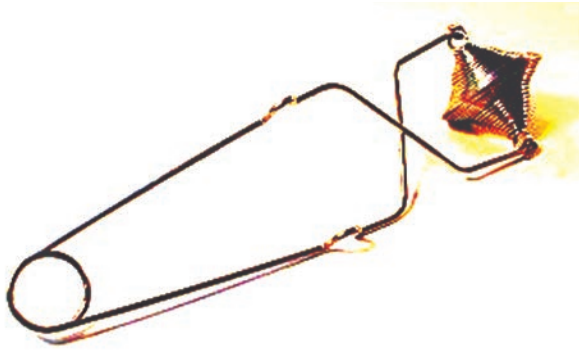


Fig. 1.30: Flour duster

Flour Duster

This tool is also known as a flour shaker or flour wand. It is used to dust a work surface with flour perfectly to prevent sticking on the surface. The flour duster can also be used to lightly sprinkle confectioner's sugar or cocoa on top of cakes.

Fig. 1.31: Flour sifter

Flour sifter

Flour sifters are used for sifting flour, cocoa and powdered sugar to ensure fineness and mixing of dry ingredients. Sifting of flour helps in even distribution of leavening agents like baking soda and baking powder.

Fig. 1.32: Parchment paper

Parchment paper

Parchment paper is used for lining cake tins and baking trays. It is greaseproof, non-stick and moisture resistant, thus prevents sticking of cake and biscuits on the surface of the tray. It is also known as butter paper and can be folded into cones for piping icing or chocolate.

Piping bags

You have seen the decorative borders of icing or chocolate on cakes, pastry and cookies, these decorations are done using piping bags and nozzles. Piping bags are available in reusable plastic lined canvas and disposable bags.

Fig. 1.33: Piping bags

Decorating nozzles

These are available in a range of designs and sizes. Decorating nozzles are made of stainless steel or chrome-plated and attached in pastry bag through a coupler (a plastic ring). These should be washed in warm, soapy water and dried completely before storing.

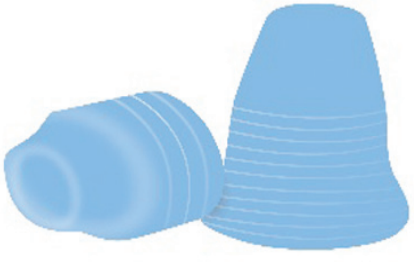


Fig. 1.34: Coupler

Fig. 1.35: Decorating nozzles

Rolling pin

Rolling pin is used to roll out sheets of dough for biscuit, puffs, pie pastry, sugar cookie dough and bread dough.

Fig. 1.36: Rolling pin

Wire cooling rack

Wire cooling racks are required for cooling hot baking pan and tins after removal from the heated oven. While spraying icing or chocolate on top of cookies, cakes or pastries, cooling racks allows falling of extra icing drips through the rack.

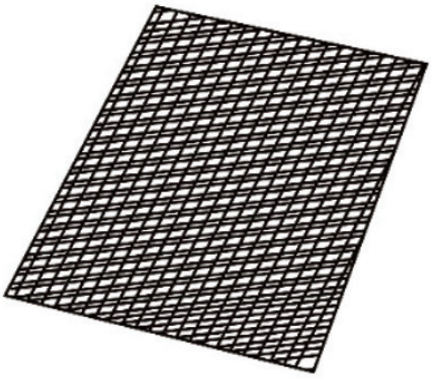


Fig. 1.37: Wire cooling rack

Fig. 1.38: Cake stand

Cake stand

A cake stand is used for icing and decorating the cake. Cake can be turned around in any direction just by moving it in required direction. Some

Fig. 1.39: Cutters

stands have a top like a turn table, i.e., the top circle rotates 360 degrees.

Cutters

Cutters are used to cut the dough sheet into the desired shape of biscuits and cookies. It has a sharp edge of 1inch level to cut through the biscuit dough.

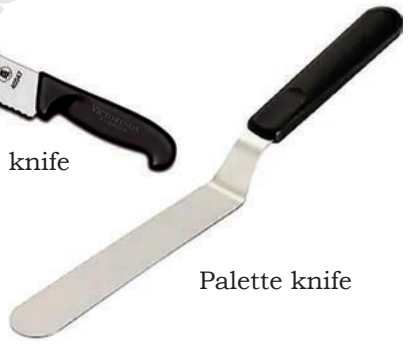
Knife

In day-to-day bakery operations, four types of knives are required — heavy duty chef's knife (8 to 12 inch), a paring knife (3 inch), serrated bread knife (10 inch) and palette knife. A palette knife is a kitchen tool designed for the use of spreading a frosting or cream on cake.

Chef's Knife

Paring knife

Serrated bread knife



Palette knife

Fig. 1.40: Different types of bakery knife

Consumables in Bakery and their Usage

	**Brown paper sheet** 1. Base or lining in baking trays for breads.
	**Baking paper** 1. Majorly spread as lining the cake moulds and baking trays for baking cookies 2. Wrapping sheet for spring rolls

	**Aluminium foil sheet** 1. Mainly used for food storage and lining cake rings 2. Prevents loss of moisture while cooking
	**Muffin's cup** 1. Base or lining in muffin trays. 2. Serving base for rum balls and chocolates
	**Cake base** 1. Used as base for cakes for selling
	**Packing boxes** 1. Varieties of boxes are used for packing breads, cakes, cookies and chocolates.

Equipment and Utensils used in a Baking Unit

Tools are used to prepare material like dough and batter towards baking, whereas, most of the equipment is used to do the actual cooking.

Refrigerator

A refrigerator keeps the foods fresh and prevents from spoilage for long duration by maintaining a cooling temperature below 5°C. Commercial refrigerators are available in different sizes and can be chosen according to the storage need and production capacity of the bakery unit. A refrigerator should be cleaned and rearranged weekly.

Fig. 1.41: Refrigerator

Food Processor

A food processor performs many functions such as chopping, dicing, mixing some pastry doughs, grinding, and pureeing fruits and vegetables.

Fig. 1.42: Food Processor

Fig. 1.43: Creaming by blender

Fig. 1.44: Hand blender

Preheating

The act of turning on oven and letting it heat up to the right temperature for a specific bakery product is called preheating the oven.

Hand Mixer

Hand mixer is used for whipping cream or egg whites, beating egg yolks and making cake frostings. It incorporates the air into cream or egg white and makes them light, fluffy and voluminous.

Oven

An oven is an enclosed cavity or tunnel where dough or batter is surrounded by a hot environment and becomes baked and transformed into bread, cookies, sponges, or other products. Different types of manufacturing facilities like a hotel bakery, standalone bakery, bakery factory or industrial bakery used different type of ovens based upon their needs and type of product to be produced. Gas oven, Coal oven, *Bhatti* and Electric oven are the most common type of ovens used in bakery.

Fig. 1.45: Coal oven

Fig. 1.46: Microwave oven

Fig. 1.47: Commercial electric oven

Proofing chamber

These chambers are used for keeping fermented dough for bread, rolls, buns, etc., for final proofing. Optimum temperature and humidity need to be maintained during proofing to ensure correct volume.

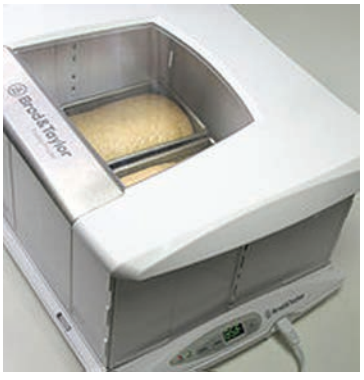


Fig. 1.48: Home proofing chamber

Fig. 1.49: Commercial proofing chamber

Proofing

Proofing is 'final fermentation', which means allowing dough to rise after it has been shaped and before it is baked.

Planetary mixer

Planetary mixers are used for mixing the dough and cake. It performs other functions like kneading, beating and whipping also. It moves around its own axis and throughout the circumference of the utensil in which the dough and baking ingredients are kept. It comes with interchangeable attachments like dough hook, whisk and mixing paddle that can be changed and used according to the need of the bakery product.

Fig. 1.50: Planetary mixer

Dough kneader

Dough kneaders are used to knead the dough in bulk volume for commercial bakeries. It has a removable bowl and beater which is washed and cleaned after every use.

Weighing scale

Scales are essential for weighing ingredients and maintaining consistency in baked product for each batch. Weighing scales are of two types vis., manual and electronic.

Fig. 1.51: Electronic digital scales

Fig. 1.52: Dough sheeter

Fig. 1.53: Blow torch

Fig. 1.54: Sugar Mill

Electronic scales are more versatile and accurate for a bakery setup because even small quantities of ingredients can also be measured on it.

Dough sheeter

The dough sheeter is used for rolling various types of dough into sheets of desired and consistent thickness.

Blow torch

The blow torch is filled with inflammable gas and used for caramelising the outer crust or layer of baked products.

Sugar mill

Commercial bakeries install own setup of sugar mill to obtain the powdered sugar for preparations. Different sizes of sugar grain are milled by the bakers for variety of uses.

Check Your Progress

A. Multiple Choice Questions

1. A _____ keeps the foods fresh and prevents from spoilage for long duration by maintaining a cooling temperature below 5°C.
   (a) oven (b) refrigerator
   (c) proofing chamber (d) all of the above

2. _____is used to caramelise the outer layer of baked products.
   (a) Food processor (b) Sieve
   (c) Blow torch (d) all of the above
3. Electronic weighing machine is used for the _____.
   (a) exact measurement of ingredients
   (b) mixing of the ingredients
   (c) proofing of the bread
   (d) none of the above
4. Sugar mill in bakery is used to _____.
   (a) powder the sugar crystals
   (b) caramelise the sugar
   (c) sieving of the flour with sugar
   (d) both (a) and (b)
5. Bread gets volume by _____.
   (a) fermentation (b) aeration
   (c) layering (d) all of the above

B. Mark the statement True or False

1. The dough sheeter rolls the dough evenly for preparation.
2. Planetary mixer is used as a food processor.
3. Heat is circulated inside the oven by radiation method.
4. A refrigerator should be cleaned and rearranged weekly.
5. Proofing chambers are used to activate fermentation before baking.

C. Fill in the blanks

1. Baking cups are made of _____and are used to line muffin pans.
2. Equally distributed heat circulates inside the _____ by convection method.
3. The blow torch is filled with _____ gas.
4. _____ scales are more versatile and accurate for a bakery setup.
5. Hand mixer is used for _____ cream or egg whites.

D. Short answer type questions

1. Describe five hand tools used in bakery. Also write their functions.
2. Write the names of traditional ovens for baking.
3. Enumerate the functions of bench scrapper.
4. What is the different capacity of measuring spoons used by a Baker?
5. Enlist any five heavy equipment used in bakery.

Session 3: Bakery Ingredients

The quality of the basic ingredients used in baking, such as flour, edible oil, sugars, eggs, etc., play an important role in bakery. Therefore, selection of quality raw material and ingredients is the initial step. This unit deals with various ingredients used for preparing bakery products.

Categories of Bakery Ingredients

Ingredients can be categorised based on their primary role in baking as given in Figure 1.55.

Flours

Flours are the backbone of bakery products. It is prepared by grinding raw cereal grains, like wheat, corn, oats, etc., into powders of different coarseness. Flours consist of proteins (mainly in gluten form), a small proportion of fat, carbohydrates, fibre, minerals, vitamins and moisture. Choosing the right type of flour for specific bakery product ensures the best possible baking results.

The various types of flour used in bakery products are discussed here.

Wheat flour

This is the most commonly consumed flour worldwide than any other type of flour. It is obtained by milling the wheat grain. A wheat grain is composed of three parts (as shown in Figure 1.56):

(i) The endosperm (rich in protein and starch) (85%)
(ii) The bran (rich in fibre) (12%)
(iii) The germ or embryo (rich in protein, fat and vitamin) (3 %)

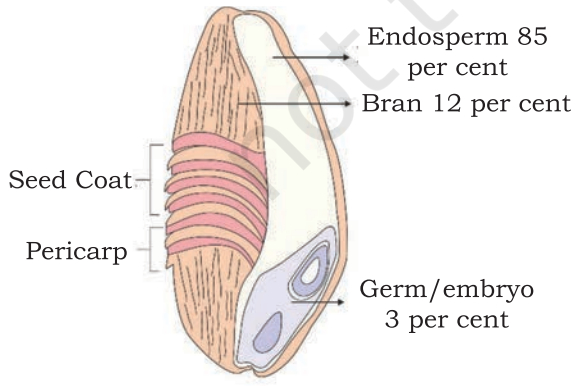
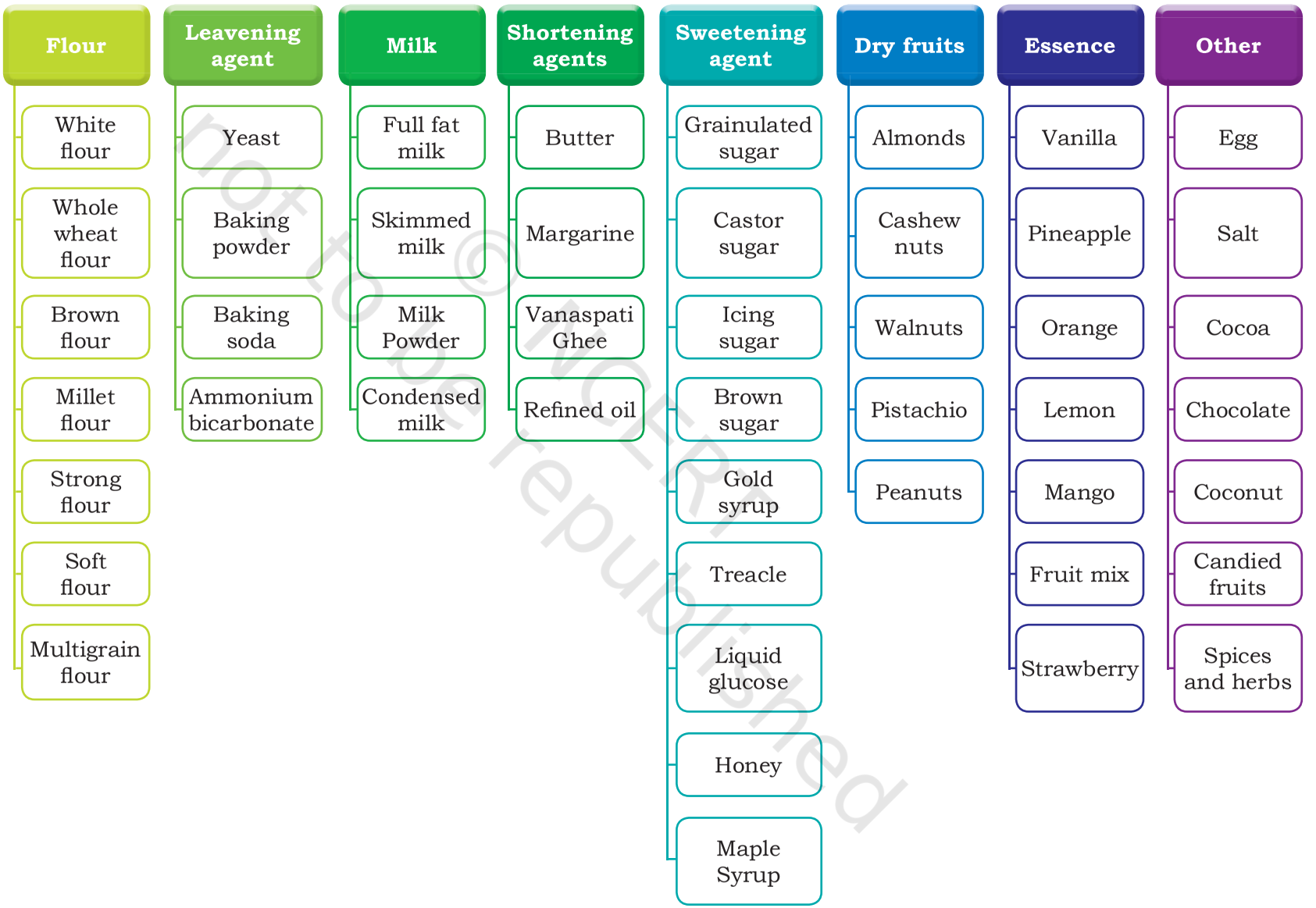


Fig. 1.56: Structure of wheat grain

In refined wheat flour, only the endosperm of the grain is taken and bran and germs are removed whereas whole wheat flour has all the endosperm, bran and germ of the grain. During dough preparation, when the water is added, it is absorbed by starch granules and they swell up and gel. When this dough is baked, the gelled starch sets and form

Fig. 1.55: Categorisation of ingredients on the basis of their primary role



the physical structure of the baked item. Wheat flour contains a unique protein called gluten. The stronger the gluten, the more water it will absorb and the dough will be more elastic. When the dough is baked in a hot oven, it expands to several times of its original volume. Thus, higher gluten protein content is required for bread preparation; on the other hand, lower protein content is desired in pastry and cake baking.

Types of flours based on protein and gluten content

S. No.	Types of Flour	Protein content (%)	Gluten Content	Usage
1.	Hard/Strong flour	10 to 14 %	High	Breads, buns, rolls and patties
2.	Soft/Weak Flour	5 to 10 %	Low	Cake, crackers and pastry preparation

Corn flour

Corn flour is used in the production of crusty corn breads and muffins. Corn has no gluten but it gives a distinctive flavour and a pleasant yellow colour that is desirable in many products.

Oat flour

Oats are used primarily in breakfast foods and snacks. It is used to fortify the breads. Oat flour has vitamin B, E, minerals, iron, and a fair amount of fibre.

Millets flours

Barley, sorghum and finger-millets flours come in this category and are popular in India and Central America. They are utilised in the making of flat bread, tortillas, and pancakes. Millets flours are becoming popular because of their superior nutritional value and health benefits.

Leavening agent

We get the rise of volume in bakery products because of leavening agents. Different leavening agents are used for different bakery products.

Yeast

Yeast is a leavening agent which helps the dough to rise in the presence of moisture and warmth and in turn produces carbon dioxide which increases the volume of the dough. Yeast is available both in fresh as well as dried form.

Baking powder

Fig. 1.57: Baking powder

Baking powder is a chemical compound and used as a leavening agent. It is a mixture of sodium bi-carbonate, an acid (cream of tartar/ tartaric acid/ citric acid) and a filler usually rice, potato or corn starch.

Baking Powder = Sodium Bicarbonate + Cream of tartar

Sodium bicarbonate, when heated, releases only 50 per cent of the total carbon dioxide. Addition of an acid ingredient to the sodium bicarbonate (an alkaline salt) causes release of up to 100 per cent carbon dioxide. The acid present neutralises the leftover soda so that no after taste is left in the product.

Baking soda

Baking soda is the chemical name of sodium bicarbonate and has the chemical formula $NaHCO_3$. It is also known as 'bicarbonate of soda'. During the baking process, it liberates carbon dioxide, a leavening gas. Baking soda also liberates carbon dioxide gas when it is mixed with acidic substances like sour milk, buttermilk or vinegar. Sodium bicarbonate is popular because of its low cost, lack of toxicity, ease of handling and easy availability.

Ammonium bicarbonate

It is used extensively in cookies and in bakery products that are baked almost to dryness. During the baking process, it decomposes completely into gases like ammonia, carbon dioxide and water vapour. It should be measured precisely for usage because a slight excess can spoil the quality of the biscuit or cookies.

Milk and milk products

These are used for multiple functions like softening the texture of cookies and biscuits, moistening the bread, and adding flavour and nutritive value to the product. Milk is classified into different categories on the basis of their fat percentage. The different types of milk with their fat percentage are:

Full fat milk	Skimmed milk	Milk powder	Condensed milk
Fat = 3.5%	Fat = 0.1%	Nil	Fat = 8% Sugar = 44%

Shortening agents

Shortening agents are used to make the product moist and crispy. They are fat obtained from animal and plant sources. Different types of shortening agents used in bakery are:

Types of shortening agents

Butter	Margarine	Vanaspati ghee	Refined oil
Fat = 85 %	Fat = 80 %	Fat = 100 %	Fat = 100 %
Obtained from churning the milk	Obtained from hydrogenated oils	Made from vegetable oils	Obtained from oilseeds
Used in biscuit, cookies and cakes	Cheaper substitute of butter in biscuit, cookies and cakes	Used in all fried bakery products	Used for glazing the products, lining the tins and moulds

Sugar

This is an integral part of baking. Sugar acts as a sweetener as well as plays a vital role in the development of taste, texture, flavour and appearance of baked goods. The sugar in bread dough provides a substrate to grow the yeast and multiply. Release of carbon dioxide

gas raises the dough. It contributes to the golden-brown outer crust colour of the bread.

There are varieties of sugar used in bakery. The commonly used types are given as follows.

Granulated or white sugar

This is the most commonly used sugar. It is made from sugarcane and sugar beets. The sugar grain can be used in a variety of products like cakes, cookies and biscuits.

Superfine sugar

It is a finer form of granulated sugar and is suitable for creaming in baking. It is also known as cast or sugar, which is granulated sugar processed further to make smaller or finer powder like crystals.

Icing sugar

It is also known as confectioners' sugar. The granulated sugar is ground into a light and airy, fine powder through different sized sieves. Corn-starch is added around 3%, to prevent clumping because sugar is very hygroscopic. It's ideal for dusting, icing, frosting and other decoration.

Brown sugar

It is unrefined raw sugars. It is sold as light brown sugar or golden (about 3.5% molasses) and dark brown sugar (approximately 6.5% molasses). It adds caramel flavour and golden-brown colour to cookies, cakes and muffins.

Golden Syrup

It is an amber coloured syrup, a by-product of sugar refining. It is used by the baker for ginger cakes and biscuits.

Honey

It is thick sweet natural syrup made by bees from the nectar of flowers. It is used in fresh ginger breads, nuggets, etc.

Treacle

It is an uncrystallised syrup, made during the refining of sugar. It is dark in colour with a more pronounced flavour than golden syrup.

Liquid Glucose or Corn syrup

It is made by boiling starch in water so that it is gelatinised. A weak acid is added to the gel to get sugar. It is used in cakes and biscuits and in sugar boiling. It moistens the products and keeps them soft. It is preferred in rich icing as it does not crystalise the sugars in it.

Maple syrup

It is the sap obtained from the Maple tree and is used as a substitute of sugar and honey in most of the bakery products.

A fresh egg sinks in water whereas a stale one floats.

Eggs

After flour, eggs are the second most important material used by the baker. Both, egg white and egg yolk are of great importance. Egg white works as leavening agent and makes cakes and pudding lighter and fluffier. During baking it solidifies to lock in the air. On the other hand, egg yolks emulsify well providing richness and moisture to baked goods. An average egg weighs around 50–55 gm. Eggs can be stored in the refrigerator for a week or two.

Cocoa powder

This is used for chocolate baked products. It is produced from the beans of the cocoa tree. It is used in various baked goods, icings, fudges and sauces preparation.

Chocolate

This is perhaps one of the most tempting products in a bakery. It is a mixture of cocoa powder, cocoa butter and sugar. Dark, bitter-sweet or semi-sweet, milk and white chocolates are the most common chocolates in commercial baking.

Salt

Salt plays a key role in formation and stabilisation of the gluten structures in bread making. It controls the speed of fermentation in yeast aerated goods. It also helps in retaining moisture and thus gives a superior texture.

Salt in a small quantity is also known to enhance flavours during baking.

Dried fruits and nuts

These are of great importance in cakes, pastries and puddings in terms of adding aesthetic as well as nutritive value and specific flavour. Raisins, currents, prunes, coconut are a few examples of dried fruit used in various bakery preparations. Most commonly used nuts are almonds, cashew nuts, walnuts, pistachio and peanuts.

Candied fruit

They are used in cakes and cookies to enhance the impact of taste, when used in appropriate proportion into the product. Examples include orange peel, lemon peel and tutti frutti, etc.

Essence

Essences are used in preparation of cake and pastries. It comes in vast variety of flavours to impart specific flavour to the products. It is generally in liquid form and prepared synthetically. The names of various essences are vanilla, pineapple, orange, lemon, mango, fruit mix and strawberry.

Spices

These are used to impart specific flavours and aroma to bakery products. The most commonly used spices in baking are cinnamon, nutmeg, ginger, cloves, cardamom, garlic, etc.

Check Your Progress

A. Multiple Choice Questions

1. To impart aroma, _____ is added to bakery products.
   (a) salt (b) essence
   (c) flour (d) water
2. To enhance the impact of taste, _____ are added to cakes.
   (a) candied fruits (b) spices
   (c) yeast (d) herbs

3. Salt _____ the speed of fermentation in yeast aerated goods.
   (a) increases (b) retards
   (c) neutralises (d) None of the above
4. Dark chocolate is a mixture of _____, cocoa butter and sugar.
   (a) solid milk (b) coffee
   (c) cocoa powder (d) All of the above
5. A fresh egg _____ in water whereas a stale one floats.
   (a) sinks (b) floats
   (c) submerges (d) breaks

B. Mark the statement True or False

1. For making icing sugar, corn-starch is added around 3%.
2. Essence is generally in powder form and prepared synthetically.
3. Margarine is made from hydrogenated oils, milk, colour and salt.
4. Full cream milk contains more than 3.5% of fat.
5. Golden syrup is used by the baker for french fries.

C. Fill in the blanks

1. Selection of the right raw ingredients is the _____ step in bakery.
2. Flours are the backbone of _____ products.
3. _____ is a mixture of cocoa powder, cocoa butter and sugar.
4. Herbs and spices are used in breads to enhance the impact of _____.
5. An average egg weighs around _____ gm.

D. Short answer type questions

1. Enlist different types of candied fruits used in cake preparation.
2. Name various forms of sweetening agents used in bakery.
3. What is the role of salt as an ingredient in baking?
4. Brief the various forms of milk and milk products used in baking.
5. What are the leavening agents used by a Baking Technician?

dough pieces enter the oven, their surface temperature begins to increase and heat transfers slowly towards the core of the product. Expansion of the dough followed by drying of the surface and crust browning are the three stages of the baking process. During these three stages of baking, several reactions such as gelatinisation of the flour starch, caramelisation of sugar, water evaporation results in desired volume, texture, flavour and appearance of the product. Temperature and time for baking is specific for each product.

Categories of Bakery Products

Bakery products are an integral part of daily life in many parts of the world. Right from morning breakfast to dinner, bakery products are used everyday. Now you must be wondering if the bakery items can be categorised.

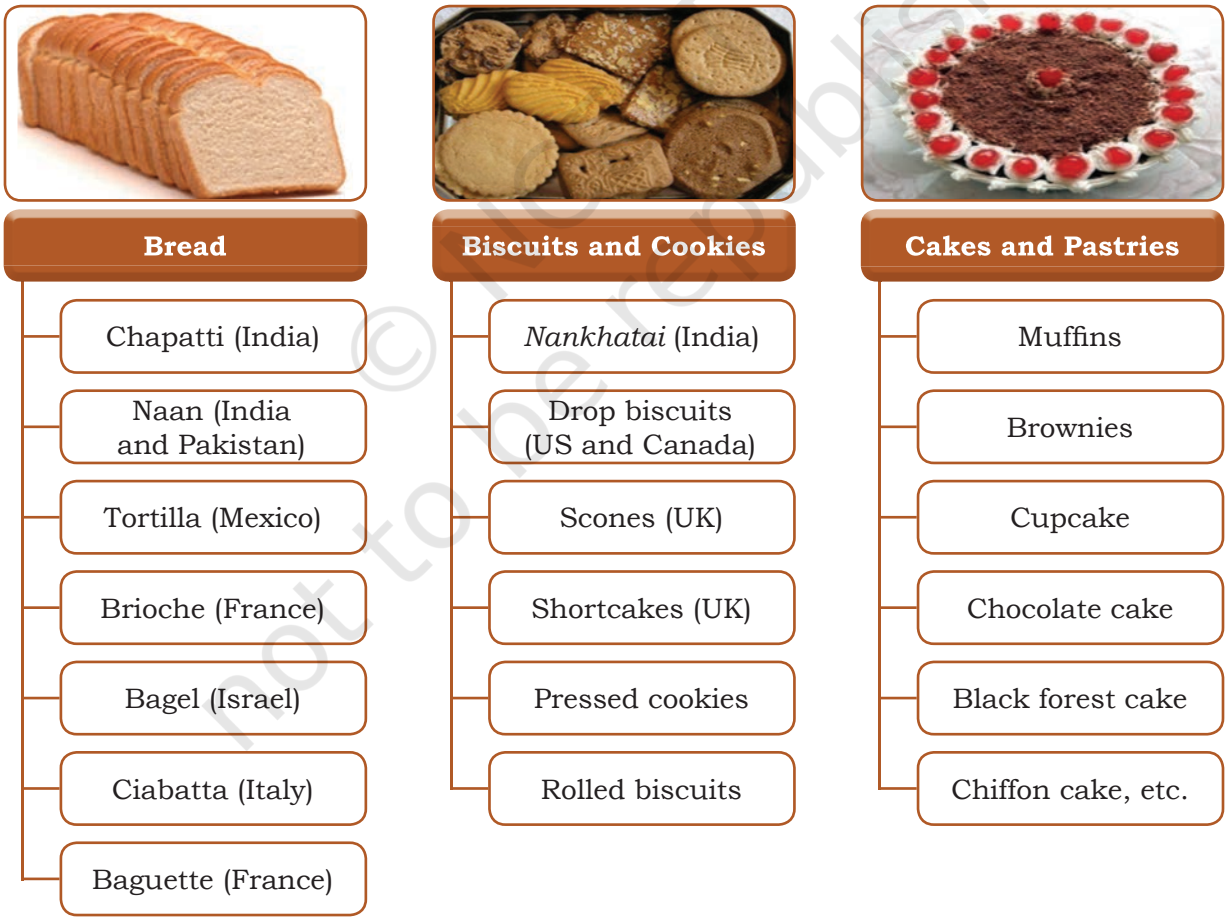


Fig. 1.1: Categories of bakery products

Bakery items are classified into three major categories:

(i) Bread: It is the second most consumed bakery product in India, after biscuits and cookies. Buns, doughnuts, etc., come under this category.

(ii) Biscuits: Biscuits are small baked products, one of the most loved food products for every age group. *Nankhatai*, cookies, crackers, etc., are similar products.

(iii) Cakes and Pastries: A birthday celebration is incomplete without cake. Sponge cake, cup-cake, carrot cake, Angel cake are some of the varieties. There are different varieties of cakes available in the market.

Overview of Bakery Industry

Baking has been a form of cooking since the ancient times of using hot stones and has evolved into an art form globally to now, in the modern era of baking in automatic electric and gas ovens.

Fig. 1.2: Traditional baking oven

Fig. 1.3: Modern domestic baking oven

Bread baking began in Ancient Greece around 600 BC. Baking is believed to be introduced by Egyptians around 2600 BC. They used to prepare bread using wild wheat, wild barley, sugar and water. The modern Indian chapattis, made from unleavened whole wheat flour, and Mexican tortillas, made from corn, resemble the older generation of breads.*

Fig. 1.4: Bread preparation during ancient days

*https://tinyurl.com/c5365fea

Fun Facts

- The word 'cookie' comes from the Dutch word '*koekje*', which means little cake and was used by North Americans in early years of 18th century.
- Today's biscuits once used to be called 'Biscotti'. The name 'biscotti' is derived from 'bis' meaning twice and 'cotto' meaning baked or cooked in Italian.

(https://tinyurl.com/45k5mn2m)

- Baking powder and baking soda were invented in 18th century, before that yeast and eggs were used to prepare cake.

https://tinyurl.com/f55bddj4

The demand of bakery products like readymade breads, patties, biscuits, pizza, etc., is increasing day-by-day because of their easy availability, convenient handling and busy lifestyle of people. Development of high-tech automated machines has made the baking process efficient, easier and added value to the bakery products.

Overview of Indian Baked Products

India is among the top producers of wheat, rice and other cereals, which are the primary ingredients for bakery products. Baking process has been a crucial part of the ancient Indian kitchen. Baking imparts a unique taste, texture and flavour to the baked products. Indian traditional style baking involves *chulha*, *bhatti* and tandoors for the preparation of traditional items like naan, roti, *kulcha, baati, litti,* baked potatoes, etc.

Fig. 1.5: Nankhatai

Fig. 1.6: Baati

Fig. 1.7: Litti

Advantages of Baking over other Cooking Methods

Various methods of cooking are roasting, frying, grilling and pressure cooking. Baking has many advantages over these cooking methods.

(i) Baking offers a variety of taste and textures with the use of few simple ingredients.

(ii) Bakery extends the storage life of products like biscuits and cookies due to less water or moisture content.

(iii) The baking process retains most of the nutrients thus offers nutritive choices to consumers.

(iv) It requires minimum basic types of equipment, thus less expensive in comparison to other food businesses.

Roles and Responsibilities of a Baking Technician

A Baking Technician is responsible for baking of products, maintaining their consistency and quality, while meeting the defined Standard Operating Procedures (SOPs) and leveraging their skills to operate ovens in synchronisation with proof box and rest of the unit. A Baking Technician also assists a Craft Baker and Plant Baker in day-to-day operations of the bakery plant.

The main duties and responsibilities of a Baking Technician include:

(i) Preparing dough and placing it into the pans or sheets to keep into the oven for baking
(ii) Gathering ingredients to measure and mix them.
(iii) Prepare baked products conforming to all the quality standards as per the standard operating procedures
(iv) Operate oven, plant and machineries and equipment in synchronisation with the proofing process
(v) Prepare and maintain the work area, machineries and tools
(vi) Plan production, equipment utilisation and manpower
(vii) Post production cleaning and regular maintenance of equipment
(viii) Follow and maintain food safety and hygiene in the work environment

A Craft Baker produces baked products such as, breads, puffs, cookies, cakes, pastries, desserts, etc., in artisan bakeries and patisseries.

A Plant Baker produces and supervises the production of baked products in industrial units by various methods using various industrial equipment.

Check Your Progress

A. Multiple Choice Questions

1. Baking is the method of cooking food by _____ in an oven.
   (a) dry heat (b) moist heat
   (c) frying (d) roasting
2. Which is not a baked item?
   (a) Bread (b) French fries
   (c) Biscuit (d) Cake

3. Baking is believed to be introduced by _____ around 2600 BC.
   (a) French (b) Egyptians
   (c) European (d) None of the above
4. The three major categories of baked items include bread, biscuit or cookies and _____.
   (a) french fries (b) cakes and pastries
   (c) chocolates (d) All of the above
5. Mexican tortillas are made from_____.
   (a) eggs (b) corn
   (c) sugar (d) All of the above

B. Mark the statement True or False

1. In the baking process, action of heat is modified by steam on food products.
2. The word 'Cookie' was used by North Americans for little cake.
3. Tortilla is a kind of staple bread from France.
4. Keeping the preparation area clean is the duty of a Baking Technician.
5. Brownie is a version of cake.

C. Fill in the blanks

1. Naan, roti and kulcha are traditionally baked in _____ and *bhatti*.
2. Bakery extends the _____ of products like biscuits and cookies.
3. The chapattis are made from _____ dough of whole wheat flour.
4. The term 'Biscotti' has originated from _____.
5. Baguette is a kind of _____ bread.

D. Short answer type questions

1. Enlist the various types of cake and pastry products.
2. Name the different type of cooking methods. How is baking different from these?
3. What is the role of a Baking Technician?
4. Name any five products made by baking.

Session 2: Tools and Equipment used in a Bakery Unit

The baking process requires various types of equipment, utensils and tools. The design and size of equipment depends upon the volume of sales expected.

In this session, we shall describe about various tools and equipment used in bakery. Here is the list of items used to prepare biscuit, cakes, pastry and other bakery products.

Tools Used in Baking

Different baking processes need specific bakery tools for optimum and desired quality of the finished product. Some of the basic tools and equipment are explained below.

Baking Tools	Equipment	Utensils
• Measuring spoons, cups and glasses • Whisks • Spatulas and brushes • Bench scraper • Dough scraper • Mixing spoons • Flour duster • Flour sifter • Parchment paper • Pastry bags • Decorating nozzles • Rolling pin • Knife and Cutters • Cake stand	• Refrigerator • Gas burners • Food processor • Electric blenders • Oven • Proving chamber • Dough mixer or kneader • Dough sheeter • Blow torch • Sugar mill • Mixer and grinder • Weighing scales	• Pans • Trays • Moulds • Baking sheet • Wire cooling rack • Working tables

Fig. 1.8: Basic baking tools, equipment and utensils

Fig. 1.9: Layer cake pan

Pans, trays and moulds

These are the fundamental tools for baking. Variety of pans, trays and moulds of all sizes and materials are used to give desirable shapes and design to the cake, biscuit, cookie and breads. Heavy-duty, silver-coloured tins have a tendency to absorb heat and cook to a desired colour and texture of a product.

Layer Cake Pans

Layer cake pans are used in preparation of traditional layer cake recipes where layering is done in cakes. These pans are usually 8 or 9 inches in diameter and atleast 2 inches deep to prevent overflow of the batter.

Fig. 1.10: Layered cake

Loaf Pans

Loaf pans are used in preparation of bread. An ideal size of pan for larger loaves is 9 × 5 × 2 inch and 8 × 4 × 2 inch for smaller loaves. Pans made up of iron or tin are dark in colour and utilised for crusty dark coloured breads, whereas pans made up of aluminium are suitable for light coloured breads. Nowadays, non-stick pans are used to ensure easy release of the bread loaf.

Fig. 1.11: Bread loaf Pan

Muffin Pans

Muffin pans are used to bake muffins, cupcakes and brownies. It is usually made up of metal or silicone, rectangular in shape. Standard muffin pans have six or twelve chambers measuring about 2 inches at the top and 1 inch deep. Mini, standard, and jumbo sizes are commonly available.

Fig. 1.12: Silicone muffin pan

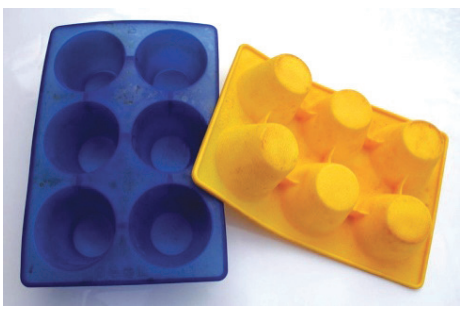


Fig. 1.13: Metal muffin baking pan

Baking cups

Baking cups are made of paper or foil or reusable silicone and are used to line muffin or cupcake pans. The baking cups hold the batter making it easy to release the baked cakes from the pan.

Fig. 1.14: Silicone baking cups

Spring Form Pans

Spring form pans have openable sides which are secured with a clamp. They are round in shape and have a removable bottom. Delicate cakes that could be damaged by turning them upside down while removing them from the pan are prepared using spring form pans. Sides of the pan expand and release the bottom, when clamp is opened to take out the baked cake.

Fig. 1.15: Spring form pans

Fig. 1.16: Opening spring of the pan

Square Baking Pans

Square baking pan is used for small cakes, brownies and bar cookies. The pan size has to be at least 8 inches and 2 to 3 inches deep to prevent overflow of batter.

Fig. 1.17: Square baking pans

Angel Food Cake Pans

Angel food cake pan is tall, round and has a tube up in the centre. The tube

The cake was named as Angel food cake because of its texture which was so light that even angels could eat it and still fly without being weighed down.

(https://tinyurl.com/rwhbfp5t)

up structure imparts the hole in the middle of the cake. These pans are used to bake angel food cake. The pans are kept ungreased to allow the cake to raise high. This pan is also known as bundt pan and tube pan. These pans resemble savarin mould which is hollow.

Fig. 1.18: Angel food cake pan

Fig. 1.19: Angel food cake in bundt pan

Fig. 1.20: Baking sheet

Fig. 1.21: Cookie sheet

Fig. 1.22: Measuring spoons

Baking sheets

Baking sheet is like a tray and has raised edges all around. It is made of iron, tin or heavy-duty aluminium and can be used for baking cookies as well as toasting nuts.

Cookie sheets

A cookie sheet is a flat metal sheet, rimless, designed for placing rows of cookies. A light-coloured heavy-duty aluminium baking sheet retains heat better and encourages even baking.

Measuring spoons

Small quantity of ingredients is measured using measuring spoons. Salt, baking powder, baking soda, lemon juice, yeast, spices and leaveners are required in small quantities and are measured accurately using measuring spoons. Generally, a measuring spoon set consists of 6 small spoons of varying sizes of ⅛ teaspoon, ¼ teaspoon, ½ teaspoon, 1 teaspoon, ½ tablespoon and 1 tablespoon.

Measuring cups and measuring glass

Flour, sugar, cream, butter, etc., are generally measured using measuring cups and measuring jar. A set of measuring cups includes sizes of ¼ cup, ⅓ cup, ½ cup and 1 cup.

Measuring glass is used for measuring liquid ingredient.

Fig. 1.23: Measuring glass

Fig. 1.24: Measuring cup

Fig. 1.25: Whiskers

Whiskers

Whiskers are used to beat eggs, creaming, folding and stirring together wet and dry ingredients. They give volume by aerating foods in cake making.

Spatula

Spatulas are used for scraping the dough and batter from the sides and bottom of the mixing bowl. They are also used for folding the ingredients and spreading the fillings.

Fig. 1.26: Spatula

Bench scraper

Bench scraper has a straight edge and is marked with measurement markings. Its functions are given in Figure 1.28.

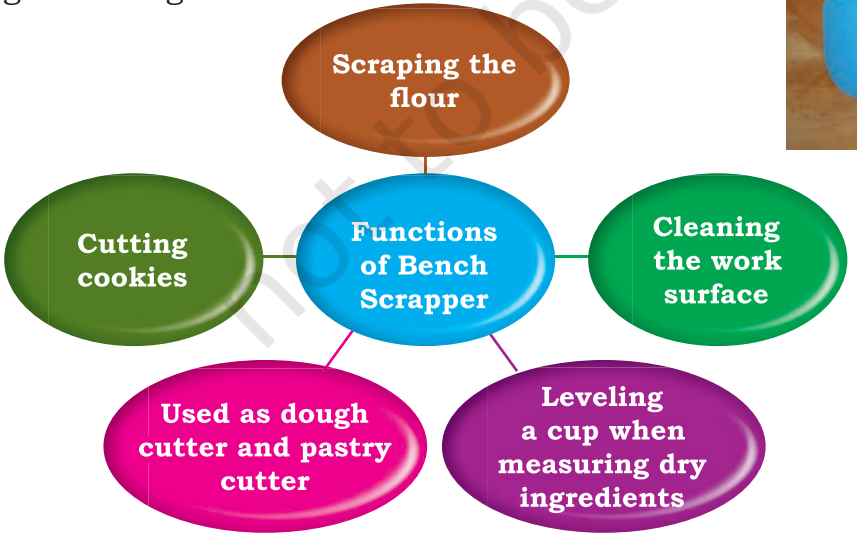


Fig. 1.28: Functions of bench scraper

Fig. 1.27: Bench Scraper

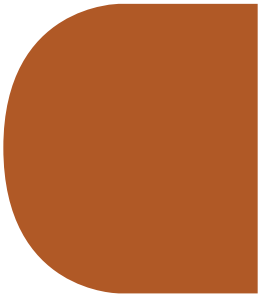


Fig. 1.29: Dough scraper

Dough scraper

Dough scraper has a rounded edge at one side and flat edge on the other side. The round edge is useful for scraping dough, batter, and cream out of a utensil whereas flat edge is used for levelling the batter in pan and cleaning the work surface.

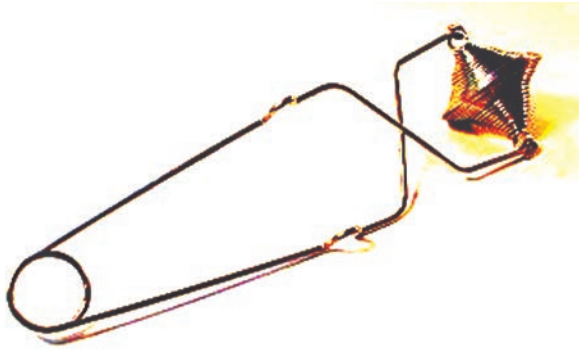


Fig. 1.30: Flour duster

Flour Duster

This tool is also known as a flour shaker or flour wand. It is used to dust a work surface with flour perfectly to prevent sticking on the surface. The flour duster can also be used to lightly sprinkle confectioner's sugar or cocoa on top of cakes.

Fig. 1.31: Flour sifter

Flour sifter

Flour sifters are used for sifting flour, cocoa and powdered sugar to ensure fineness and mixing of dry ingredients. Sifting of flour helps in even distribution of leavening agents like baking soda and baking powder.

Fig. 1.32: Parchment paper

Parchment paper

Parchment paper is used for lining cake tins and baking trays. It is greaseproof, non-stick and moisture resistant, thus prevents sticking of cake and biscuits on the surface of the tray. It is also known as butter paper and can be folded into cones for piping icing or chocolate.

Piping bags

You have seen the decorative borders of icing or chocolate on cakes, pastry and cookies, these decorations are done using piping bags and nozzles. Piping bags are available in reusable plastic lined canvas and disposable bags.

Fig. 1.33: Piping bags

Decorating nozzles

These are available in a range of designs and sizes. Decorating nozzles are made of stainless steel or chrome-plated and attached in pastry bag through a coupler (a plastic ring). These should be washed in warm, soapy water and dried completely before storing.

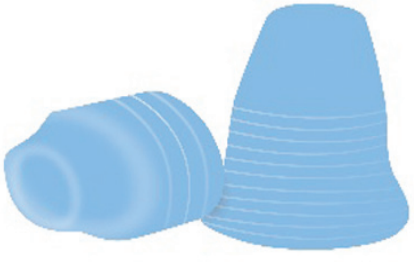


Fig. 1.34: Coupler

Fig. 1.35: Decorating nozzles

Rolling pin

Rolling pin is used to roll out sheets of dough for biscuit, puffs, pie pastry, sugar cookie dough and bread dough.

Fig. 1.36: Rolling pin

Wire cooling rack

Wire cooling racks are required for cooling hot baking pan and tins after removal from the heated oven. While spraying icing or chocolate on top of cookies, cakes or pastries, cooling racks allows falling of extra icing drips through the rack.

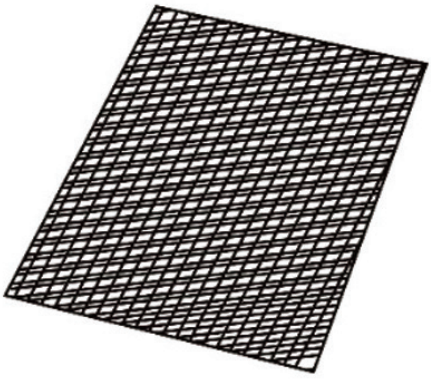


Fig. 1.37: Wire cooling rack

Fig. 1.38: Cake stand

Cake stand

A cake stand is used for icing and decorating the cake. Cake can be turned around in any direction just by moving it in required direction. Some

Fig. 1.39: Cutters

stands have a top like a turn table, i.e., the top circle rotates 360 degrees.

Cutters

Cutters are used to cut the dough sheet into the desired shape of biscuits and cookies. It has a sharp edge of 1inch level to cut through the biscuit dough.

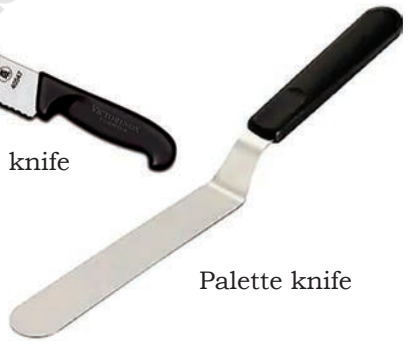
Knife

In day-to-day bakery operations, four types of knives are required — heavy duty chef's knife (8 to 12 inch), a paring knife (3 inch), serrated bread knife (10 inch) and palette knife. A palette knife is a kitchen tool designed for the use of spreading a frosting or cream on cake.

Chef's Knife

Paring knife

Serrated bread knife



Palette knife

Fig. 1.40: Different types of bakery knife

Consumables in Bakery and their Usage

	**Brown paper sheet** 1. Base or lining in baking trays for breads.
	**Baking paper** 1. Majorly spread as lining the cake moulds and baking trays for baking cookies 2. Wrapping sheet for spring rolls

	**Aluminium foil sheet** 1. Mainly used for food storage and lining cake rings 2. Prevents loss of moisture while cooking
	**Muffin's cup** 1. Base or lining in muffin trays. 2. Serving base for rum balls and chocolates
	**Cake base** 1. Used as base for cakes for selling
	**Packing boxes** 1. Varieties of boxes are used for packing breads, cakes, cookies and chocolates.

Equipment and Utensils used in a Baking Unit

Tools are used to prepare material like dough and batter towards baking, whereas, most of the equipment is used to do the actual cooking.

Refrigerator

A refrigerator keeps the foods fresh and prevents from spoilage for long duration by maintaining a cooling temperature below 5°C. Commercial refrigerators are available in different sizes and can be chosen according to the storage need and production capacity of the bakery unit. A refrigerator should be cleaned and rearranged weekly.

Fig. 1.41: Refrigerator

Food Processor

A food processor performs many functions such as chopping, dicing, mixing some pastry doughs, grinding, and pureeing fruits and vegetables.

Fig. 1.42: Food Processor

Fig. 1.43: Creaming by blender

Fig. 1.44: Hand blender

Preheating

The act of turning on oven and letting it heat up to the right temperature for a specific bakery product is called preheating the oven.

Hand Mixer

Hand mixer is used for whipping cream or egg whites, beating egg yolks and making cake frostings. It incorporates the air into cream or egg white and makes them light, fluffy and voluminous.

Oven

An oven is an enclosed cavity or tunnel where dough or batter is surrounded by a hot environment and becomes baked and transformed into bread, cookies, sponges, or other products. Different types of manufacturing facilities like a hotel bakery, standalone bakery, bakery factory or industrial bakery used different type of ovens based upon their needs and type of product to be produced. Gas oven, Coal oven, *Bhatti* and Electric oven are the most common type of ovens used in bakery.

Fig. 1.45: Coal oven

Fig. 1.46: Microwave oven

Fig. 1.47: Commercial electric oven

Proofing chamber

These chambers are used for keeping fermented dough for bread, rolls, buns, etc., for final proofing. Optimum temperature and humidity need to be maintained during proofing to ensure correct volume.

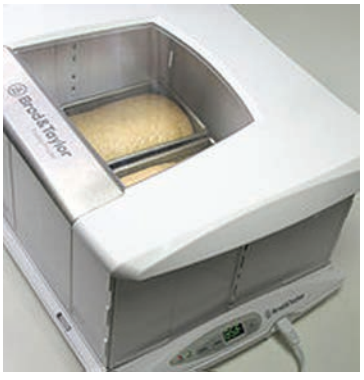


Fig. 1.48: Home proofing chamber

Fig. 1.49: Commercial proofing chamber

Proofing

Proofing is 'final fermentation', which means allowing dough to rise after it has been shaped and before it is baked.

Planetary mixer

Planetary mixers are used for mixing the dough and cake. It performs other functions like kneading, beating and whipping also. It moves around its own axis and throughout the circumference of the utensil in which the dough and baking ingredients are kept. It comes with interchangeable attachments like dough hook, whisk and mixing paddle that can be changed and used according to the need of the bakery product.

Fig. 1.50: Planetary mixer

Dough kneader

Dough kneaders are used to knead the dough in bulk volume for commercial bakeries. It has a removable bowl and beater which is washed and cleaned after every use.

Weighing scale

Scales are essential for weighing ingredients and maintaining consistency in baked product for each batch. Weighing scales are of two types vis., manual and electronic.

Fig. 1.51: Electronic digital scales

Fig. 1.52: Dough sheeter

Fig. 1.53: Blow torch

Fig. 1.54: Sugar Mill

Electronic scales are more versatile and accurate for a bakery setup because even small quantities of ingredients can also be measured on it.

Dough sheeter

The dough sheeter is used for rolling various types of dough into sheets of desired and consistent thickness.

Blow torch

The blow torch is filled with inflammable gas and used for caramelising the outer crust or layer of baked products.

Sugar mill

Commercial bakeries install own setup of sugar mill to obtain the powdered sugar for preparations. Different sizes of sugar grain are milled by the bakers for variety of uses.

Check Your Progress

A. Multiple Choice Questions

1. A _____ keeps the foods fresh and prevents from spoilage for long duration by maintaining a cooling temperature below 5°C.
   (a) oven (b) refrigerator
   (c) proofing chamber (d) all of the above

2. _____is used to caramelise the outer layer of baked products.
   (a) Food processor (b) Sieve
   (c) Blow torch (d) all of the above
3. Electronic weighing machine is used for the _____.
   (a) exact measurement of ingredients
   (b) mixing of the ingredients
   (c) proofing of the bread
   (d) none of the above
4. Sugar mill in bakery is used to _____.
   (a) powder the sugar crystals
   (b) caramelise the sugar
   (c) sieving of the flour with sugar
   (d) both (a) and (b)
5. Bread gets volume by _____.
   (a) fermentation (b) aeration
   (c) layering (d) all of the above

B. Mark the statement True or False

1. The dough sheeter rolls the dough evenly for preparation.
2. Planetary mixer is used as a food processor.
3. Heat is circulated inside the oven by radiation method.
4. A refrigerator should be cleaned and rearranged weekly.
5. Proofing chambers are used to activate fermentation before baking.

C. Fill in the blanks

1. Baking cups are made of _____and are used to line muffin pans.
2. Equally distributed heat circulates inside the _____ by convection method.
3. The blow torch is filled with _____ gas.
4. _____ scales are more versatile and accurate for a bakery setup.
5. Hand mixer is used for _____ cream or egg whites.

D. Short answer type questions

1. Describe five hand tools used in bakery. Also write their functions.
2. Write the names of traditional ovens for baking.
3. Enumerate the functions of bench scrapper.
4. What is the different capacity of measuring spoons used by a Baker?
5. Enlist any five heavy equipment used in bakery.

Session 3: Bakery Ingredients

The quality of the basic ingredients used in baking, such as flour, edible oil, sugars, eggs, etc., play an important role in bakery. Therefore, selection of quality raw material and ingredients is the initial step. This unit deals with various ingredients used for preparing bakery products.

Categories of Bakery Ingredients

Ingredients can be categorised based on their primary role in baking as given in Figure 1.55.

Flours

Flours are the backbone of bakery products. It is prepared by grinding raw cereal grains, like wheat, corn, oats, etc., into powders of different coarseness. Flours consist of proteins (mainly in gluten form), a small proportion of fat, carbohydrates, fibre, minerals, vitamins and moisture. Choosing the right type of flour for specific bakery product ensures the best possible baking results.

The various types of flour used in bakery products are discussed here.

Wheat flour

This is the most commonly consumed flour worldwide than any other type of flour. It is obtained by milling the wheat grain. A wheat grain is composed of three parts (as shown in Figure 1.56):

(i) The endosperm (rich in protein and starch) (85%)
(ii) The bran (rich in fibre) (12%)
(iii) The germ or embryo (rich in protein, fat and vitamin) (3 %)

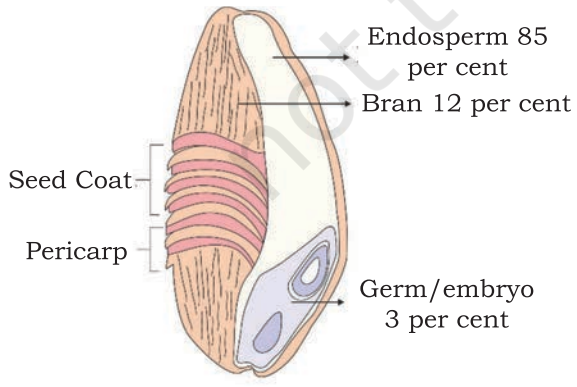
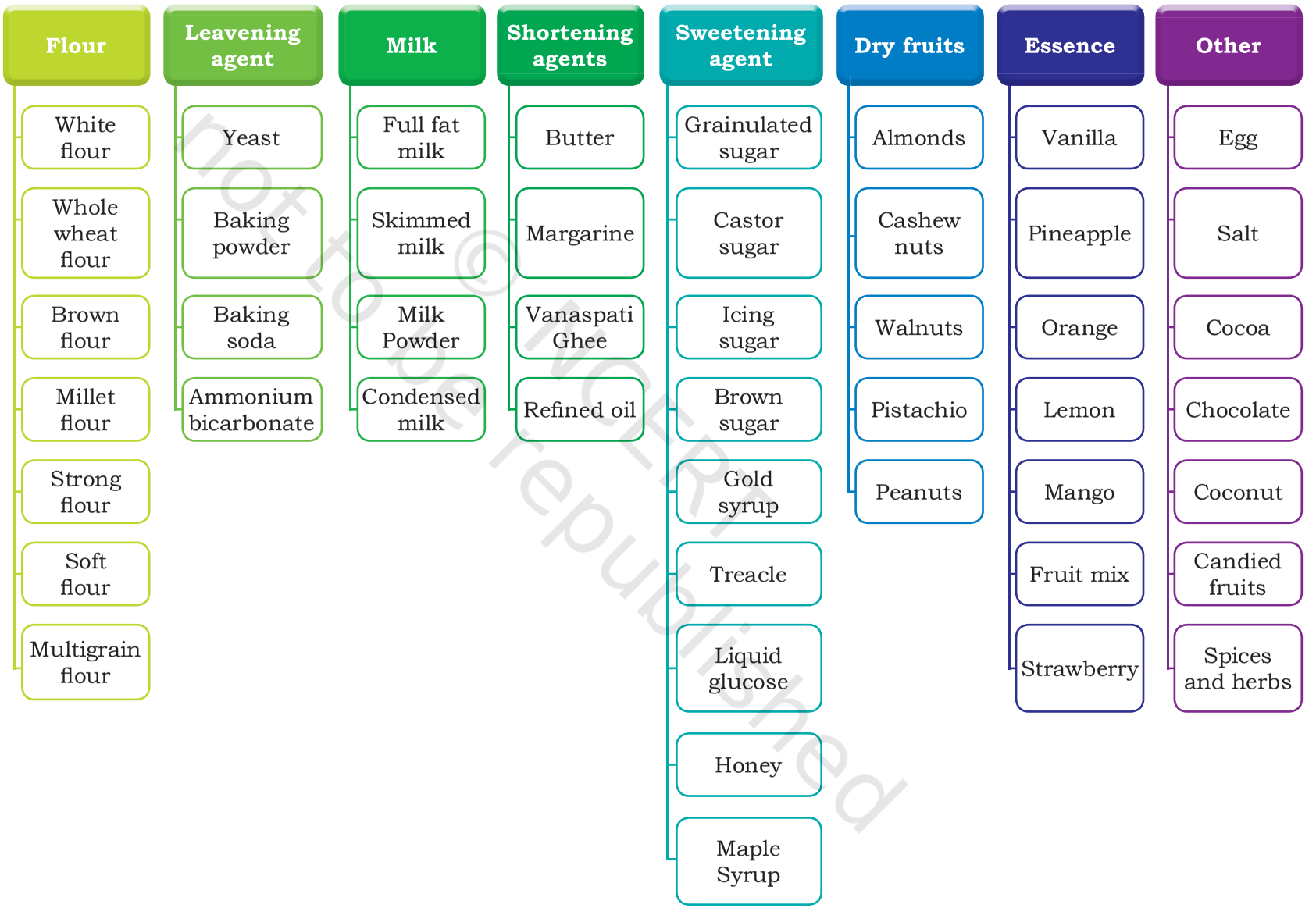


Fig. 1.56: Structure of wheat grain

In refined wheat flour, only the endosperm of the grain is taken and bran and germs are removed whereas whole wheat flour has all the endosperm, bran and germ of the grain. During dough preparation, when the water is added, it is absorbed by starch granules and they swell up and gel. When this dough is baked, the gelled starch sets and form

Fig. 1.55: Categorisation of ingredients on the basis of their primary role



the physical structure of the baked item. Wheat flour contains a unique protein called gluten. The stronger the gluten, the more water it will absorb and the dough will be more elastic. When the dough is baked in a hot oven, it expands to several times of its original volume. Thus, higher gluten protein content is required for bread preparation; on the other hand, lower protein content is desired in pastry and cake baking.

Types of flours based on protein and gluten content

S. No.	Types of Flour	Protein content (%)	Gluten Content	Usage
1.	Hard/Strong flour	10 to 14 %	High	Breads, buns, rolls and patties
2.	Soft/Weak Flour	5 to 10 %	Low	Cake, crackers and pastry preparation

Corn flour

Corn flour is used in the production of crusty corn breads and muffins. Corn has no gluten but it gives a distinctive flavour and a pleasant yellow colour that is desirable in many products.

Oat flour

Oats are used primarily in breakfast foods and snacks. It is used to fortify the breads. Oat flour has vitamin B, E, minerals, iron, and a fair amount of fibre.

Millets flours

Barley, sorghum and finger-millets flours come in this category and are popular in India and Central America. They are utilised in the making of flat bread, tortillas, and pancakes. Millets flours are becoming popular because of their superior nutritional value and health benefits.

Leavening agent

We get the rise of volume in bakery products because of leavening agents. Different leavening agents are used for different bakery products.

Yeast

Yeast is a leavening agent which helps the dough to rise in the presence of moisture and warmth and in turn produces carbon dioxide which increases the volume of the dough. Yeast is available both in fresh as well as dried form.

Baking powder

Fig. 1.57: Baking powder

Baking powder is a chemical compound and used as a leavening agent. It is a mixture of sodium bi-carbonate, an acid (cream of tartar/ tartaric acid/ citric acid) and a filler usually rice, potato or corn starch.

Baking Powder = Sodium Bicarbonate + Cream of tartar

Sodium bicarbonate, when heated, releases only 50 per cent of the total carbon dioxide. Addition of an acid ingredient to the sodium bicarbonate (an alkaline salt) causes release of up to 100 per cent carbon dioxide. The acid present neutralises the leftover soda so that no after taste is left in the product.

Baking soda

Baking soda is the chemical name of sodium bicarbonate and has the chemical formula $NaHCO_3$. It is also known as 'bicarbonate of soda'. During the baking process, it liberates carbon dioxide, a leavening gas. Baking soda also liberates carbon dioxide gas when it is mixed with acidic substances like sour milk, buttermilk or vinegar. Sodium bicarbonate is popular because of its low cost, lack of toxicity, ease of handling and easy availability.

Ammonium bicarbonate

It is used extensively in cookies and in bakery products that are baked almost to dryness. During the baking process, it decomposes completely into gases like ammonia, carbon dioxide and water vapour. It should be measured precisely for usage because a slight excess can spoil the quality of the biscuit or cookies.

Milk and milk products

These are used for multiple functions like softening the texture of cookies and biscuits, moistening the bread, and adding flavour and nutritive value to the product. Milk is classified into different categories on the basis of their fat percentage. The different types of milk with their fat percentage are:

Full fat milk	Skimmed milk	Milk powder	Condensed milk
Fat = 3.5%	Fat = 0.1%	Nil	Fat = 8% Sugar = 44%

Shortening agents

Shortening agents are used to make the product moist and crispy. They are fat obtained from animal and plant sources. Different types of shortening agents used in bakery are:

Types of shortening agents

Butter	Margarine	Vanaspati ghee	Refined oil
Fat = 85 %	Fat = 80 %	Fat = 100 %	Fat = 100 %
Obtained from churning the milk	Obtained from hydrogenated oils	Made from vegetable oils	Obtained from oilseeds
Used in biscuit, cookies and cakes	Cheaper substitute of butter in biscuit, cookies and cakes	Used in all fried bakery products	Used for glazing the products, lining the tins and moulds

Sugar

This is an integral part of baking. Sugar acts as a sweetener as well as plays a vital role in the development of taste, texture, flavour and appearance of baked goods. The sugar in bread dough provides a substrate to grow the yeast and multiply. Release of carbon dioxide

gas raises the dough. It contributes to the golden-brown outer crust colour of the bread.

There are varieties of sugar used in bakery. The commonly used types are given as follows.

Granulated or white sugar

This is the most commonly used sugar. It is made from sugarcane and sugar beets. The sugar grain can be used in a variety of products like cakes, cookies and biscuits.

Superfine sugar

It is a finer form of granulated sugar and is suitable for creaming in baking. It is also known as cast or sugar, which is granulated sugar processed further to make smaller or finer powder like crystals.

Icing sugar

It is also known as confectioners' sugar. The granulated sugar is ground into a light and airy, fine powder through different sized sieves. Corn-starch is added around 3%, to prevent clumping because sugar is very hygroscopic. It's ideal for dusting, icing, frosting and other decoration.

Brown sugar

It is unrefined raw sugars. It is sold as light brown sugar or golden (about 3.5% molasses) and dark brown sugar (approximately 6.5% molasses). It adds caramel flavour and golden-brown colour to cookies, cakes and muffins.

Golden Syrup

It is an amber coloured syrup, a by-product of sugar refining. It is used by the baker for ginger cakes and biscuits.

Honey

It is thick sweet natural syrup made by bees from the nectar of flowers. It is used in fresh ginger breads, nuggets, etc.

Treacle

It is an uncrystallised syrup, made during the refining of sugar. It is dark in colour with a more pronounced flavour than golden syrup.

Liquid Glucose or Corn syrup

It is made by boiling starch in water so that it is gelatinised. A weak acid is added to the gel to get sugar. It is used in cakes and biscuits and in sugar boiling. It moistens the products and keeps them soft. It is preferred in rich icing as it does not crystalise the sugars in it.

Maple syrup

It is the sap obtained from the Maple tree and is used as a substitute of sugar and honey in most of the bakery products.

A fresh egg sinks in water whereas a stale one floats.

Eggs

After flour, eggs are the second most important material used by the baker. Both, egg white and egg yolk are of great importance. Egg white works as leavening agent and makes cakes and pudding lighter and fluffier. During baking it solidifies to lock in the air. On the other hand, egg yolks emulsify well providing richness and moisture to baked goods. An average egg weighs around 50–55 gm. Eggs can be stored in the refrigerator for a week or two.

Cocoa powder

This is used for chocolate baked products. It is produced from the beans of the cocoa tree. It is used in various baked goods, icings, fudges and sauces preparation.

Chocolate

This is perhaps one of the most tempting products in a bakery. It is a mixture of cocoa powder, cocoa butter and sugar. Dark, bitter-sweet or semi-sweet, milk and white chocolates are the most common chocolates in commercial baking.

Salt

Salt plays a key role in formation and stabilisation of the gluten structures in bread making. It controls the speed of fermentation in yeast aerated goods. It also helps in retaining moisture and thus gives a superior texture.

Salt in a small quantity is also known to enhance flavours during baking.

Dried fruits and nuts

These are of great importance in cakes, pastries and puddings in terms of adding aesthetic as well as nutritive value and specific flavour. Raisins, currents, prunes, coconut are a few examples of dried fruit used in various bakery preparations. Most commonly used nuts are almonds, cashew nuts, walnuts, pistachio and peanuts.

Candied fruit

They are used in cakes and cookies to enhance the impact of taste, when used in appropriate proportion into the product. Examples include orange peel, lemon peel and tutti frutti, etc.

Essence

Essences are used in preparation of cake and pastries. It comes in vast variety of flavours to impart specific flavour to the products. It is generally in liquid form and prepared synthetically. The names of various essences are vanilla, pineapple, orange, lemon, mango, fruit mix and strawberry.

Spices

These are used to impart specific flavours and aroma to bakery products. The most commonly used spices in baking are cinnamon, nutmeg, ginger, cloves, cardamom, garlic, etc.

Check Your Progress

A. Multiple Choice Questions

1. To impart aroma, _____ is added to bakery products.
   (a) salt (b) essence
   (c) flour (d) water
2. To enhance the impact of taste, _____ are added to cakes.
   (a) candied fruits (b) spices
   (c) yeast (d) herbs

3. Salt _____ the speed of fermentation in yeast aerated goods.
   (a) increases (b) retards
   (c) neutralises (d) None of the above
4. Dark chocolate is a mixture of _____, cocoa butter and sugar.
   (a) solid milk (b) coffee
   (c) cocoa powder (d) All of the above
5. A fresh egg _____ in water whereas a stale one floats.
   (a) sinks (b) floats
   (c) submerges (d) breaks

B. Mark the statement True or False

1. For making icing sugar, corn-starch is added around 3%.
2. Essence is generally in powder form and prepared synthetically.
3. Margarine is made from hydrogenated oils, milk, colour and salt.
4. Full cream milk contains more than 3.5% of fat.
5. Golden syrup is used by the baker for french fries.

C. Fill in the blanks

1. Selection of the right raw ingredients is the _____ step in bakery.
2. Flours are the backbone of _____ products.
3. _____ is a mixture of cocoa powder, cocoa butter and sugar.
4. Herbs and spices are used in breads to enhance the impact of _____.
5. An average egg weighs around _____ gm.

D. Short answer type questions

1. Enlist different types of candied fruits used in cake preparation.
2. Name various forms of sweetening agents used in bakery.
3. What is the role of salt as an ingredient in baking?
4. Brief the various forms of milk and milk products used in baking.
5. What are the leavening agents used by a Baking Technician?

Preparation and Maintenance of Work Area and Machineries

In this unit, you will learn about the important practices that the Baking Technician has to follow for hygienic handling of the raw material and the final product. You will also learn about the importance of personal protective equipment, preparation of work area, care and maintenance of bakery equipment and tools, sanitisation and food safety standards.

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Session 1: Personal Hygiene, Cleanliness and Sanitation

Personal hygiene is a much broader concept than personal cleanliness. Personal cleanliness refers to a clean self, whereas, personal hygiene is a calculated approach of that person to maintain their personal cleanliness as well as the cleanliness of the surroundings.

A person working in a bakery unit comes in contact with a variety of raw material and final products. The raw material and final products are susceptible to contamination from working personnel in the baking unit. Therefore, maintaining personal hygiene and sanitation becomes the responsibility of every individual working there.

Dimensions of personal hygiene are given in Figure 2.1.

Health Status	Personal Cleanliness	Desirable personal etiquettes
• Regular medical check-ups • Worker free from coughing, diarrhoea, infections or discharges of any type.	• Taking regular bath • Wearing clean uniforms • Covering cuts or wounds by waterproof dressing • Washing hands after toilet use • Washing hands after handling raw food item. • Washing hands after disposing waste.	• No Smoking, spitting or chewing things • No sneezing or coughing over uncovered food • Avoid wearing personal jewellery, watches, pins or other items.

Fig. 2.1: Dimensions of personal hygiene

Personal Protective Equipment

The bakery worker has to take the help of various Personal Protective Equipment (PPE) to carry out the work safely. PPE includes the uniform of the Baking Technician consisting of coat, aprons, trousers, chef cap, gloves and safety boots. The uniform of the chef helps in preventing contamination from daily-use clothes to the bakery. The uniform protects the bakery worker from possible injuries due to electrical hazards, heat or chemicals.

Basic clothing required while working in a bakery

Chef's cap

This is designed to hold the wearer's hair and stop the possibility of hair falling in the food. Chef's cap is also known as toque.

Chef's coat

The design of the chef's coat prevents heat waves from burners and ovens coming in contact with the worker.

Apron

Use of an apron over the chef's coat provides an extra layer of protection against hot liquids, foods and equipment. The apron also protects the coat from getting soiled by splashes while cooking.

Safety boots

Safety boots are designed to keep the bakery worker safe on slippery floors. Their soles are made from non-skid material. The boots are always worn with socks.

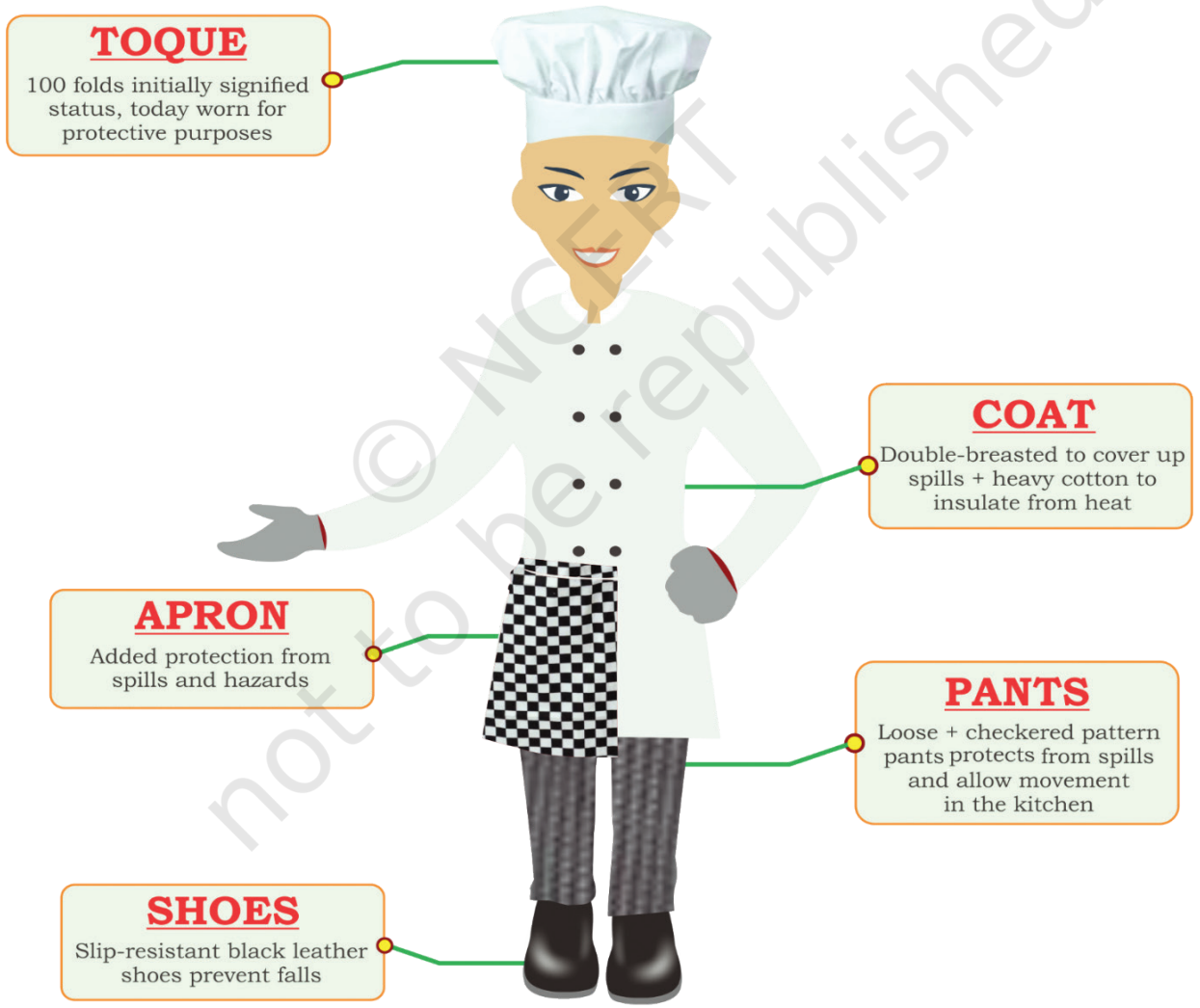

Fig. 2.2: A bakery worker in uniform with the entire PPE

Gloves

These are made from different materials and are used for different bakery operations to protect the hands of the bakery worker. Cut resistant gloves are used while using sharp knives. Oven gloves are used while removing the hot baking trays, pans and moulds from ovens. Vinyl gloves are used while handling hot chillies, peppers and garlic, etc., to avoid irritation on the finger tips.

Trousers

Loose-fitting trousers assist the bakery worker in easy movement and air circulation and help minimise the dangers from hot spillages. Traditionally, chef pants are designed to have a black and white checked pattern.

Check Your Progress

A. Multiple Choice Questions

1. Personal cleanliness refers to a clean _____.
   (a) self (b) equipment
   (c) environment (d) water
2. PPE refers to _____.
   (a) Personal Plant Equipment
   (b) Personal Protective Equipment
   (c) Protection Plan Equipment
   (d) Personal Protection Equipment
3. The uniform of the chef helps in _____ contamination from daily-use clothes to the bakery.
   (a) preventing (b) enhancing
   (c) exposing (d) None of the above
4. Chef's cap is also known as_____.
   (a) hat (b) hair net
   (c) toque (d) head cover
5. Soles of safety boots are made from _____ material.
   (a) non-skid (b) leather
   (c) smooth (d) plastic

B. Mark the statement True or False

1. Working personnel in the bakery can contaminate the food products.
2. Personal Protective Equipment (PPE) does not protect from possible injuries due to heat and chemicals.

3. Use of an apron over the chef's coat serves no purpose.
4. Cut resistant gloves are used while handling oven.
5. Traditionally, chef pants are designed to have a red and blue checked pattern.

C. Fill in the blanks

1. The design of the _____ prevents heat waves from burners and ovens.
2. Cut resistant gloves are used while using _____.
3. _____ are used while handling hot chillies, peppers and garlic.
4. _____is designed to hold the wearer's hair.
5. _____ may have a black and white checked pattern.

Session 2: Work Area Preparation

In this session we will focus on the preparation of work area and equipment for baking. This will include important practices of handling material and equipment safely.

Preparation of the Work Area

Work area

The working area is organised ergonomically to increase the efficiency of the operation and prevent food contamination. The floor of the bakery area is made of non-absorbent and washable flooring material. Floor surfaces are kept dry at all times to facilitate easy cleaning. Water supply and drainage system is checked and maintained regularly. Periodic mopping and fumigation of the area is done to prevent cross-contamination.

A sample layout of a commercial bakery shows the important features of the commercial bakery setup as well as the work area. The following points are considered in a bakery layout:

1. Water chiller, mixer, deck ovens, etc. (big equipment) are situated along the wall.
2. Entry and exit for dispatch of the materials and finished products are free from obstacles.

3. There is enough space around the working table and all the machineries like slicer, deck oven, proofer, rack oven, etc.
4. In an ideal situation all the large equipment and machineries are placed as per the work flow. To avoid any hindrance, the big equipment are placed usually around the walls.
5. Water connection and electrical connection points must be easily accessible.
6. Provision of exhaust and ventilation is a must and ensures proper air circulation.

Preparation of the Machines and Tools

Before starting the production, clean all the tools and machineries and check them for their working conditions.

Table 2.1: Preparation of the machines and tools

S.No.	Equipment	Preparation
1.	Measuring Cups and Spoons	Keep cups and spoons dry. Always measure dry ingredients first.
2.	Weighing Scale	Check for correct display and set the balance to zero for accurate measurement.
3.	Sifter or Sieve	Keep the sifters dry, and regularly use soft wire brush to clean the mesh, check for any loose ends of wire.
4.	Whisk	Clean the whisk under running water with detergent and wipe dry.
5.	Spatula	Clean the spatula under running water with detergent and wipe dry.
6.	Baking Sheet, Muffin Tin, Cake pan, Pie Dish	Clean with paper or cloth to remove all grease.

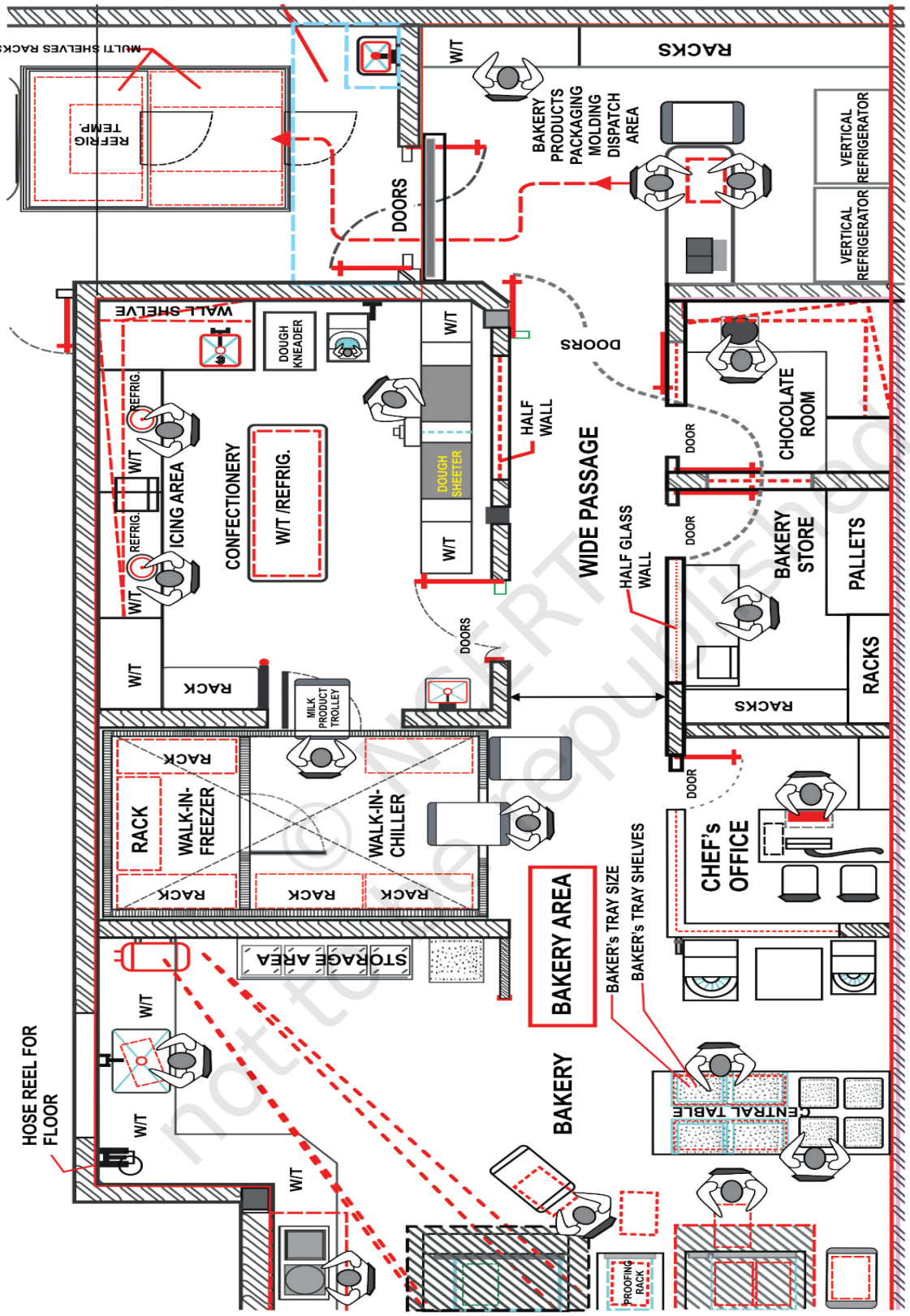

Fig. 2.3: A sample layout of a bakery unit

7.	Stand Mixer	Check the mixing bowl, spiral and the clamps. Wash clean and dry. Give a test run.
8.	Rolling Pin	Never wash a wood rolling pin with soap. Scrap any dough from the pin using a wooden or plastic scraper, and wipe it down with hot water. Wipe with cloth.
9.	Baking Stone	Baking stones in the oven must always be kept clean from any debris. Brush can be used to remove all the dust particles.
10.	Pastry Brush	Wash the brush in hot soapy water several times and rinse. Soak the brush in a standard bleach solution for 15 minutes to sanitise it.
11.	Baking Oven	Always clean the outer surface of the oven with a clean cloth. Use prescribed soap solution. Preheat the oven as per work plan of the day.
12.	Proofing Chamber	Always clean the outer surface of the chamber with a clean cloth, use prescribed soap solution. Switch on the proofing chamber and set the required temperature before bread dough proofing and preparation. Check for any leakages, check for steam jets, clean off any development of moths and molds.
13.	Working Table	Clean and sanitise the table with simple solution of vinegar and salt with water.
14.	Canisters or Bins	Check for any presence of rodents, rust and leakages.
15.	Bread Slicer	Check for blades and rotors with belt and greasing properly done. Dust off any crumbs on the conveyor belt.

Bakery Unit Operations

Bakery operation consists of material preparation and processing of raw materials to get the desired product.

Material Preparation

1. Collect and arrange the required ingredients in separate containers as per the plan and recipe.
2. Sieve all flours to remove any foreign matter. Oat flakes, sugar, millets, coarse semolina, etc., are checked visually to remove any foreign material.
3. Inspected and sieved ingredients are kept in clean containers with proper identification and weight of the ingredient.

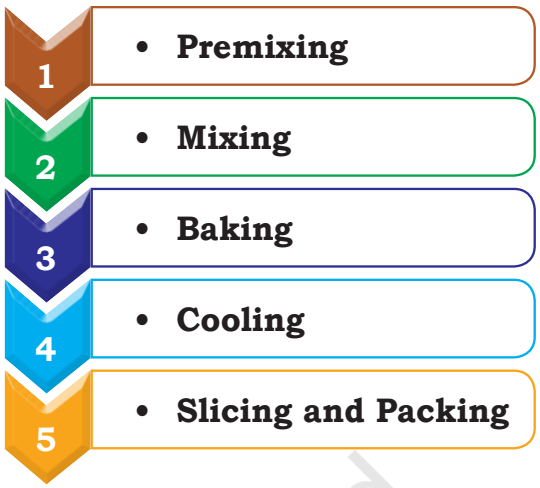

Fig. 2.4: Steps during the various stages of operation

Different unit operations

Baking operations involves premixing, mixing, baking, cooling, slicing and packaging of products. The details of different steps are discussed in Unit 4 of the textbook.

Food Safety Standards and Regulations

Food safety means that food will not cause harm to the consumer upon consumption. Food safety standards are regulated and monitored according to regulations of a country. In India, food safety standards are governed

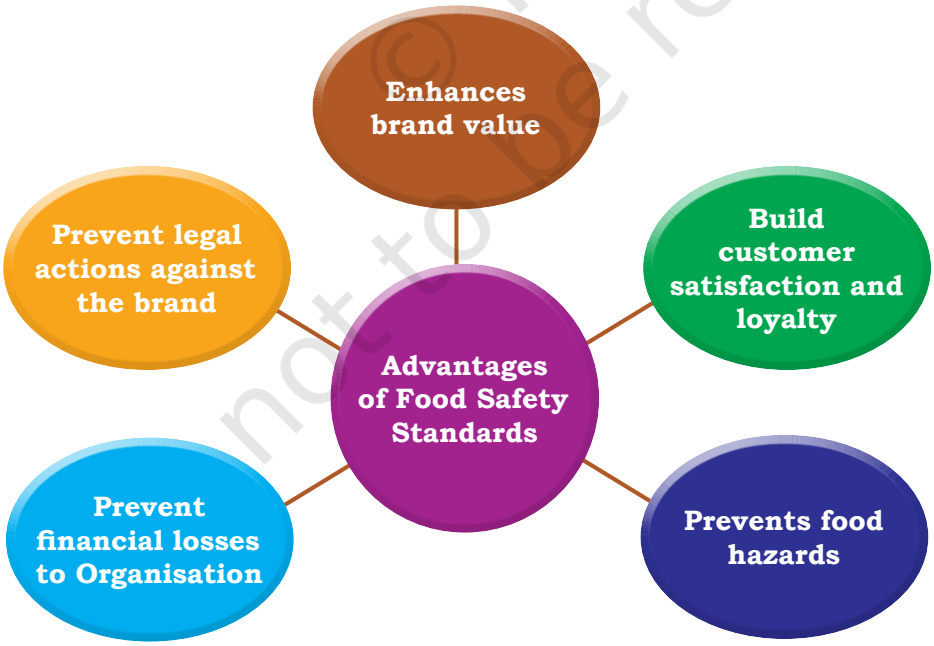

Fig. 2.5: Advantages of following Food Safety Standards

by Food Safety Standards Authority of India (FSSAI). Food safety standards and regulations ensure that the organisation follows prescribed norms and procedures.

Check Your Progress

A. Multiple Choice Questions

1. The working area is organised_____ to increase the efficiency of the operation.
   (a) ergonomically (b) colour-wise
   (c) as per space (d) as per need
2. The floor of working area must be made of _____ and washable flooring material.
   (a) non-absorbent (b) dust free
   (c) absorbent (d) smooth
3. When using measuring cups or spoon, always measure _____first.
   (a) water (b) dry ingredients
   (c) wet ingredients (d) None of the above
4. _____ is an operation of baking.
   (a) Washing (b) Cleaning
   (c) Mixing (d) All of the above
5. Food safety standards in India are governed by _____.
   (a) FCI (b) FSSAI
   (c) FDA (d) FAO

B. Mark the statement True or False

1. Fumigation of the work area does not prevent cross-contamination.
2. Big equipment such as mixer, deck ovens, etc., are to be situated along the wall.
3. Proofing chamber is used for proofing cake dough.
4. A bread slicer has blades and rotors.
5. Food safety standards do not provide safety to a food production unit against legal action.

C. Fill in the blanks

1. Floor surfaces are kept _____ at all times to facilitate easy cleaning.
2. The large equipment and machineries are to be placed as per _____.
3. Provision of _____ and ventilation is a must and ensures proper air circulation.
4. After cleaning weighing scale is set to_____.
5. FSSAI stands for _____.

Session 3: Cleaning, Sanitising and Maintaining Work Area, Machines and Tools

Maintenance of Machinery and Equipment

It is the responsibility of all bakery personnel to keep and maintain cleanliness and sanitation in the bakery. Daily cleaning and sanitisation is necessary for bakery, as both raw and baked materials are prone to contaminate. The difference between cleaning and sanitising is shown in Figure 2.6.

Cleaning
Cleaning is the complete removal of contaminants on the surfaces using appropriate detergent chemicals under recommended conditions.

Sanitising
Sanitising refers to the reduction of microorganisms to levels considered safe from a public health viewpoint.

Fig. 2.6: Difference between cleaning and sanitisation

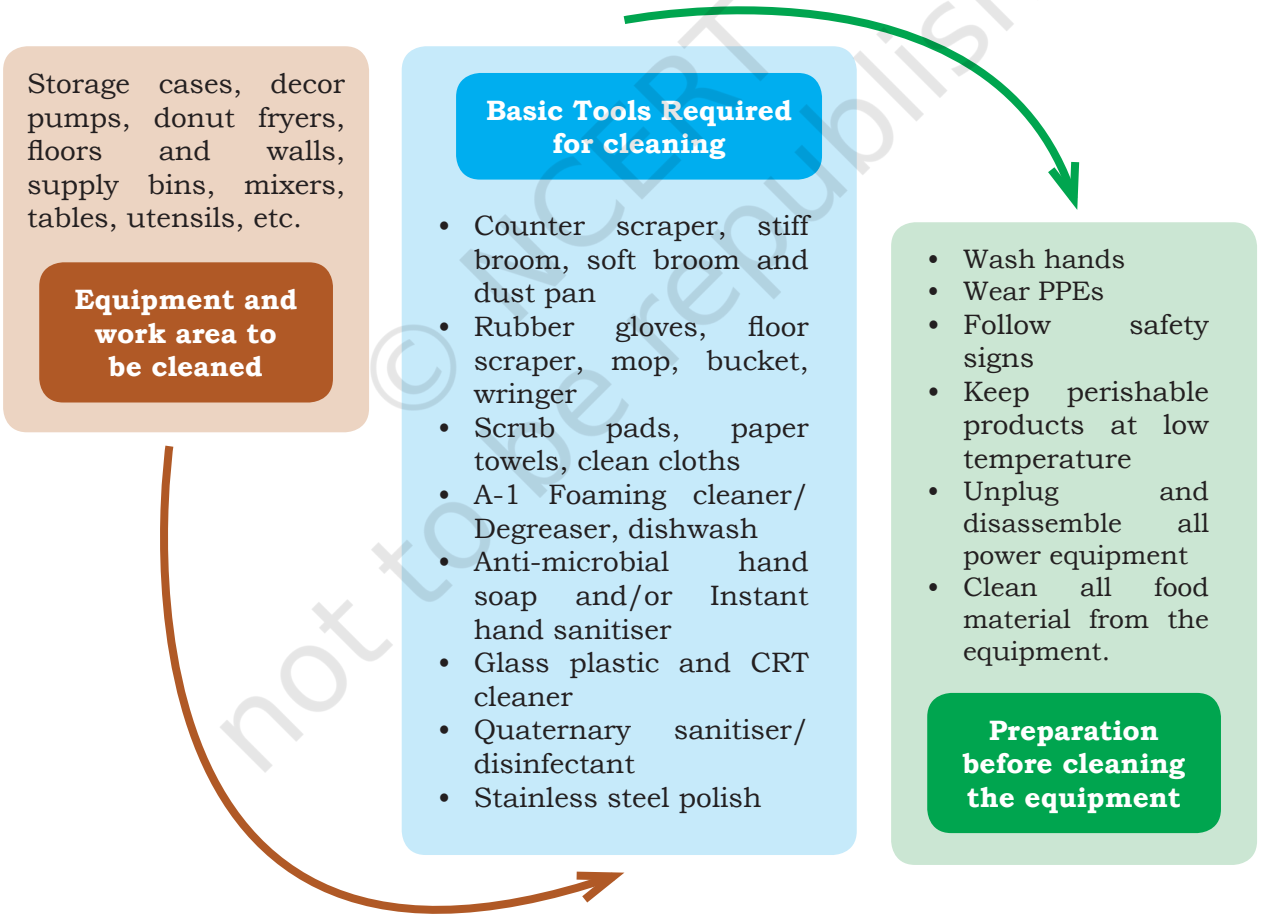

Fig. 2.7: Inter-linkages of the standard cleaning procedure

Cleaning procedure

A standard cleaning procedure consists of:

1. Preparation required before cleaning the equipment like, completing the production of an order, emptying the containers, ensuring that production supply will not be affected, deciding the method of cleaning (dry or wet), etc.
2. Equipment and area to be cleaned (removing the plug of an electrical equipment, disembling the parts of the equipment)
3. Cleaning material and equipment required (appropriate cleaning and sanitising agents and tools like brush, scrubber, gloves, etc.)

Methods used for cleaning equipment

Because we need both cleaning as well as sanitisation of the bakery equipment, therefore, we follow the triple sink method which consists of the following compartments.

Fig. 2.8: Triple sink method of cleaning

Sanitation of Equipment and Tools

After cleaning the tools and equipment, they are sanitised for making them safe and free from microbes, two sanitisation methods are:

- Thermal sanitisation
- Chemical sanitisation

Thermal sanitisation

In thermal sanitisation, steam and hot water is used to sanitise equipment and tools. Steam flow in cabinets is maintained long enough to achieve a temperature above

77°C for at least 15 minutes or above. When steam is used on assembled equipment, the temperature is maintained at 93°C for at least 5 minutes. Steam method is relatively costly as well as complex due to the difficulty in regulating and maintaining its temperature and time. The by-products of steam condensation are also difficult to clean.

Hot water sanitisation is done by either pumping the water through assembled equipment or immersing equipment into the water. The temperature is maintained at 77°C for at least 5 minutes as checked at the outlet end of the equipment when pumping the water through the equipment. When immersing equipment, the temperature of water is maintained at 77°C or above for at least 30 seconds.

Advantages	Disadvantages
• Economical in comparison to other methods of thermal sanitisation • Easy application and availability • Effective over a broad range of microorganisms • Penetrates into cracks and crevices	• Slow process that requires come-up and cool-down time • Safety concerns for employees • May cause film formation on equipment • Shortens the life of certain equipment or parts such as rubber pipes, tubes, gaskets, etc.

Fig. 2.9: Advantages and disadvantages of using hot water method

Chemical Sanitisation

Chemical compounds and acids in the form of powders, liquids and solutions are used to sanitise. The criteria of chemical sanitisers are shown in Figure 2.10.

Some of the common chemical sanitisers used in bakery are chlorine, hydrogen peroxide, white vinegar, baking soda and lemon mixture, etc.

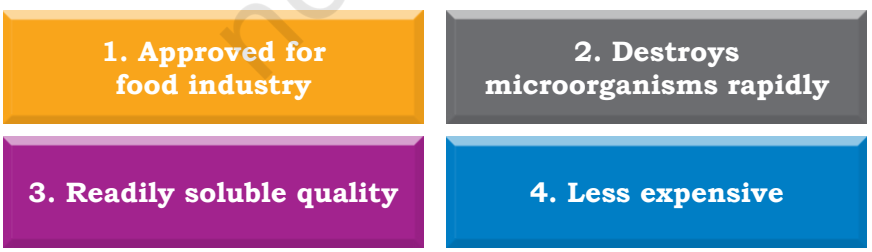

Fig. 2.10: Criteria of chemical sanitisers

Maintenance of machinery and equipment

Timely maintenance and upkeep of bakery equipment contributes to indirect savings of the firm. The following points are to be followed for the maintenance of machinery and equipment of a bakery unit:

1. Conduct regular inspections and maintenance of equipment.
2. Preventive maintenance and servicing of equipment and machinery is carried out regularly.
3. Promptly repair or replace the damaged equipment or part.
4. Repairing is carried out in such a way that products, raw material and equipment are not contaminated.
5. Lubricant, oil and grease used are of such material which should not affect the quality of bakery products.
6. Always keep the contact information of maintenance service provider readily available.

Disposal of Waste in a Bakery unit

Standard Operating Procedures (SOP's) for disposal of waste material

Waste from a bakery unit is a combination of different types of material. Bakery wastes are mostly expired and damaged breads and other ingredients like spoiled dough, soiled flour, sugar, etc., with wrappers and boxes, which are required to be disposed of periodically. Disposal of waste is to be carried out as per law by State pollution control board, etc.

Waste stores and dustbins must be kept appropriately clean, free of pests and in closed conditions.

Standard Operating Procedures

Space — To allocate space for different bins with colour codes for wet, dry and chemical garbage.

Access — To ensure waste systems are easy to use. Collection vehicles are able to approach to remove waste safely and efficiently.

Dry garbage

To make sure that garbage is not scattered in the disposal area to prevent bacterial contamination. This must be wrapped in plastic and tied and kept in bin.

Dry garbage must be separated from wet garbage.

Wet garbage

Garbage must be wrapped in plastic and tied and placed in garbage bin and covered. Wet garbage must be kept separated from dry garbage.

Chemical Waste

- All empty containers of chemicals are stacked separately to make sure that garbage is not scattered in the disposal area.
- Garbage must be wrapped in plastic and in covered bin.
- The garbage area must be cleaned twice a day.
- Cleaning should be done after transporting garbage from the garbage room.

Check Your Progress

A. Multiple Choice Questions

1. Cleaning is the complete _____of contaminants present on the surfaces.
   (a) addition
   (b) removal
   (c) washing
   (d) drying
2. _____ offers cleaning as well as sanitisation of the equipment in the bakery.
   (a) Triple sink method
   (b) Double sink method
   (c) Single sink method
   (d) None of the above
3. In _____, utensils are washed with diluted solution of soap or detergent and water.
   (a) washing compartment
   (b) sanitising compartment
   (c) rinsing compartment
   (d) None of the above

4. Diluted solution of chlorine and hot water is used for _____.
   (a) sanitisation
   (b) washing
   (c) fumigation
   (d) All of the above
5. Thermal sanitisation and _____ sanitisation are two methods of sanitisation.
   (a) herbal
   (b) drying
   (c) organic
   (d) chemical

B. Mark the statement True or False

1. Sanitisation and cleaning processes have the same procedure.
2. Hot water sanitisation is more effective than using steam.
3. Dry garbage is left open in the waste area.
4. Triple sink method consists of washing, rinsing and sanitising compartments.
5. Steam sanitisation method is more costly than hot water sanitisation.

C. Fill in the blanks

1. Sanitisation reduces the _____.
2. Diluted solution of _____ is used for sanitisation.
3. In thermal sanitisation, _____ and hot water is used to sanitise the equipment.
4. _____ is a chemical sanitiser used in bakery.
5. Dry garbage, wet garbage and _____ are the types of garbage produced in a bakery.

Food Microbiology

Microbes affect our food in many ways. Microbes in food can be helpful as well as harmful. Food microbiology deals with food safety and toxins developed by microbes in the food. In this unit we will learn about the types of microbes and causes of food spoilage. Further, handling and disposal of contaminated bakery products will be discussed.

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Session 1: Food Spoilage

Food Microbiology

The field of food microbiology studies the microorganisms, which grow on food, contaminate it and can cause spoilage of food. Microorganisms cause food spoilage and diseases, if we do not treat our foods properly. Our food is a potential source for microorganisms to grow and multiply. Understanding food microbiology help us to produce bakery products with the help of some of these microbes by controlling their growth for example breads, buns, sponges, etc.

The field and scope of food microbiology is quite vast, but we will be mainly interested in its applications in bakery and confectionary.

Fig. 3.1: Spoiled bread

Food spoilage

Our food can be spoiled by physical, chemical and microbiological agents. Such food is unfit for human consumption and called as spoiled food. Bakery products are prone to spoilage by microbial agents after their limited shelf life. The main cause for spoilage of bakery product is microorganisms such as fungi and bacteria, etc.

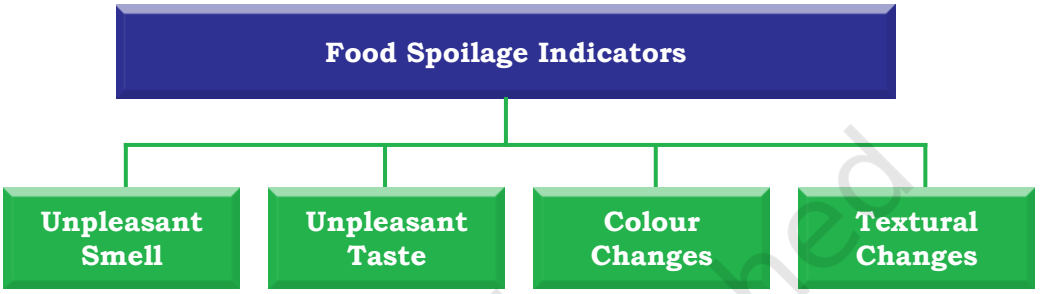


Fig. 3.2: Major indicators of food spoilage

Causes of spoilage in baked products

The different causes of spoilage in baked products are given in Fig. 3.3.

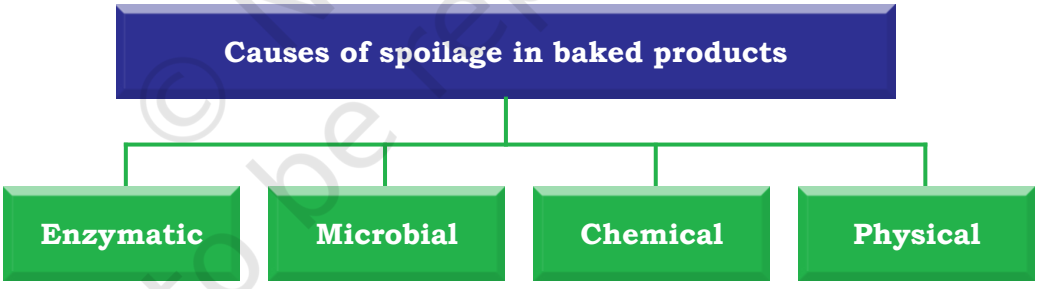


Fig. 3.3: Causes of spoilage in baked products

Enzymatic spoilage

Every food product has enzymes which cause chemical reactions in the food. In case of bakery product, once the shelf life of the product is over, enzymes within the products start decomposing the product through enzymatic reactions. For example, bread is spoiled first through enzymes. The amylase enzyme acts on starches and sugar of the bread and spoils the bread.

The enzymatic spoilage further leads to microbial growth which is discussed below. Thus, both the enzymatic and microbial spoilage takes place in bread.

Microbial spoilage

When microbes get access to food, they utilise the nutrients found in it and their numbers rise rapidly. They change the food's flavour and produce new compounds that can be harmful to humans.

Microbial spoilage in baked products is caused by fungus, moulds and bacteria. These microbes spoil bakery products by multiplying and releasing toxins that change the colour, texture and odour of the food.

Chemical spoilage

Chemical reaction in food leads to the spoilage. Excessive use of preservatives, colouring agents or leavening agents in baked products can spoil the quality of product. Addition of rancid fat spoils the taste and decreases the shelf life of the baked products.

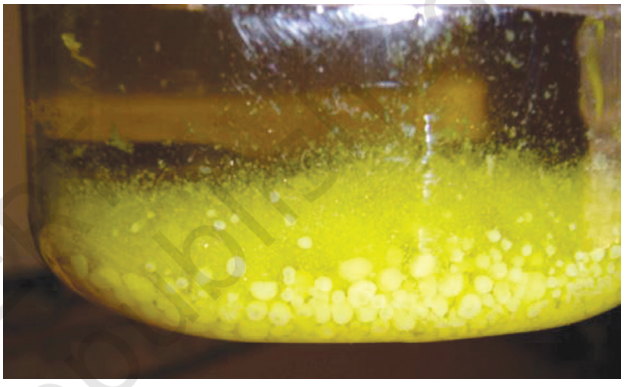


Fig. 3.4: Rancid fat

Physical spoilage

Physical spoilage of food occurs due to mishandling or inappropriate storage of the product. The outer layer of the products is bruised or damaged and microorganisms can easily enter the food material. The physical spoilage can further increase the chances of chemical and microbial spoilage and contamination. You might have noticed that if the apple skin is bruised, the apple rots faster.

Factors Affecting Food Spoilage

Moisture, acidity, temperature, time, oxygen and nutrient composition of food are responsible for its spoilage.

Moisture

Higher the moisture content, faster the growth of the microbes. For example, bread and cakes have higher

moisture content and shorter shelf life of four to five days approximately whereas, cookies have longer shelf life of two to six months due to less moisture content.

Acidity

Bacteria grow best in slightly acidic and neutral environment (pH 4.6 to 7.5).

Temperature and time

To avoid spoilage, time and temperature control balance is a must. Food borne bacteria grow and reproduce rapidly between the temperature ranges 5°C – 63°C which is also known as "temperature danger zone". Foods which are served cold such as desserts (sweet dish), must be stored at 5°C or below whereas foods which are served hot such as patties must be stored at 63°C to 70°C for the prescribed time only.

Oxygen

Bacteria are living organisms and needs oxygen and moisture to live. Bacteria differ in their oxygen requirement. Anaerobic bacteria cannot live when oxygen is present whereas aerobic bacteria can grow only in the presence of oxygen. Also there are facultative anaerobic bacteria which can grow with or without free oxygen.

Food

Microorganisms feed on protein and carbohydrates. Ingredients that contain these objects can guide the increase of microorganisms. Probably risky foods have the potential for contamination, they have the traits to allow microorganisms to grow and multiply.

Packaging and storing

Packaging is a means of safeguarding meals while it is raw, or after it has been processed or prepared. It protects food against harmful contaminants and favourable conditions for microorganisms growth such as, presence of oxygen and moisture in the surroundings.

Sources of Microorganisms

Food is spoiled by various microorganisms which are present in various forms in different sources. The various sources of microorganisms which are responsible for food spoilage are:

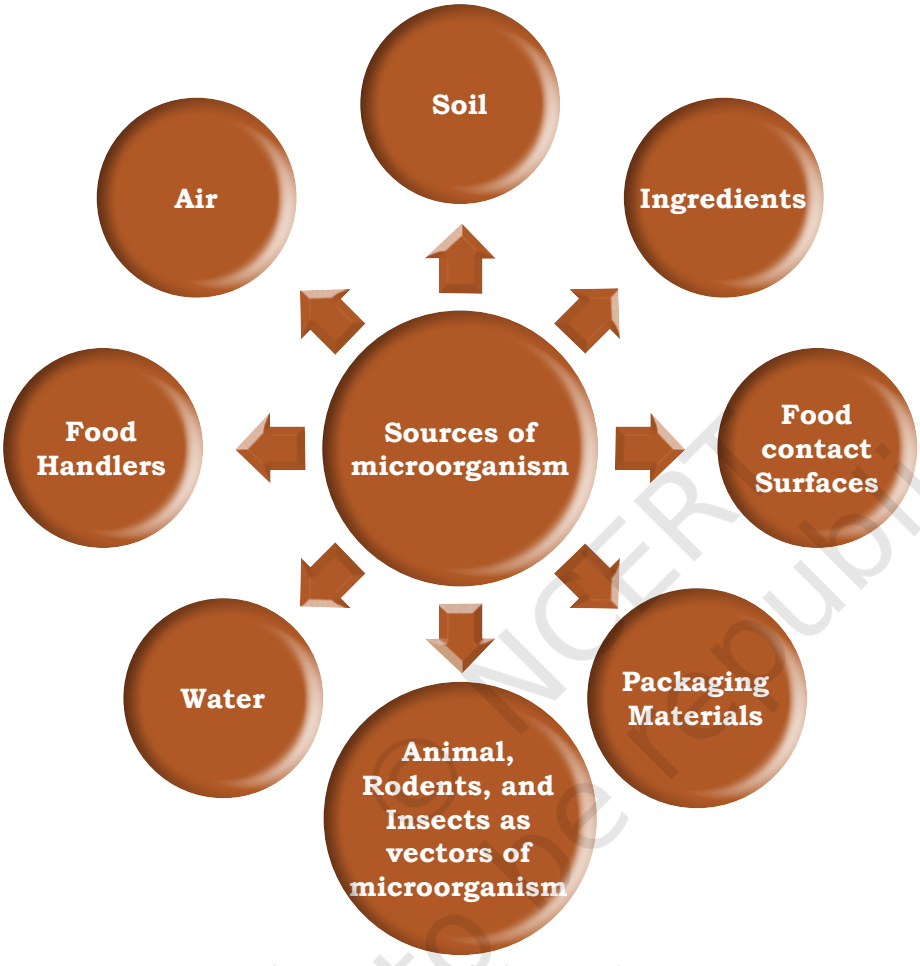


Fig. 3.5: Source of microorganisms

Practical Exercises

Activity 1

Keep a few bakery products like bread, cupcakes and biscuits at room temperature for six days. Observe and note down the changes occurring everyday in the products.

Check Your Progress

A. Multiple Choice Questions

1. Unpleasant smell and taste are the indicators of _____.
   (a) food spoilage
   (b) food safety
   (c) food quality
   (d) HACCP
2. Microbial spoilage in baked products is caused by _____.
   (a) bacteria
   (b) fungus
   (c) moulds
   (d) All of the above
3. Higher the moisture content, the growth of the microbes is _____.
   (a) faster
   (b) slower
   (c) the same
   (d) None of the above
4. Temperature danger zone _____.
   (a) prohibits the entry of microorganisms in the food
   (b) favours the growth of microorganisms
   (c) hinders the activity of microorganisms
   (d) None of the above
5. Aerobic bacteria grow only in the presence of _____.
   (a) moisture
   (b) oxygen
   (c) light
   (d) acidity
6. Microorganisms feed on _____.
   (a) fats and carbohydrates
   (b) fats and protein
   (c) protein and carbohydrates
   (d) All of the above

B. Mark the statement True or False

1. Chemical reaction in baked products leads to spoilage.
2. A microbe does not release toxins.
3. Rotten breads indicate physical spoilage.
4. Bacteria are living organisms.
5. Anaerobic bacteria needs oxygen to grow and survive.

C. Fill in the blanks

1. _____ cause spoilage of baked products.
2. Food unfit for human consumption is called _____.
3. Enzymatic, microbial, chemical and physical damage are the _____ of food spoilage.
4. The _____ enzyme acts on starches and sugar of the bread and spoils the bread.
5. Bacteria grow best in slightly acidic and neutral environment, i.e. from pH 4.6 to _____.

Session 2: Types of Microorganism

Microbes are present everywhere in soil, water, air, inside our body and that of other animals and plants. Microbes are diverse — protozoa, bacteria, fungi and microscopic animals and plant viruses (see Figure 3.6). Microbes are minute, unicellular organisms that are invisible to the naked eye. They are also known as microorganisms or microscopic organisms as they could only be seen under a microscope. They make up almost 60 per cent of the earth's living organisms.

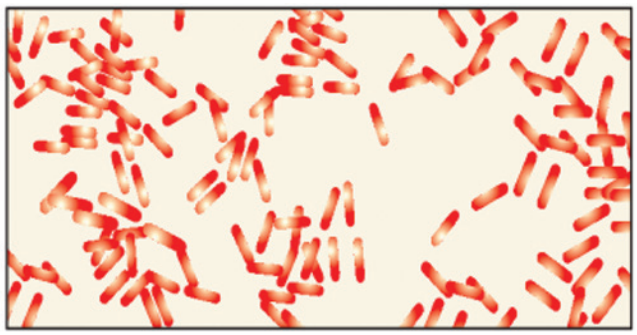
The dough, which is used for making breads, buns, or *paav* is fermented by a fungus called yeast. The puffed-up appearance of dough is due to the production of CO_2 gas. The dough, which is used for making bread, is fermented using baker's yeast (Saccharomyces cerevisiae). A number of traditional drinks and foods are also made by fermentation by the microbes.

Thus microbes play a very important role in bakery also.

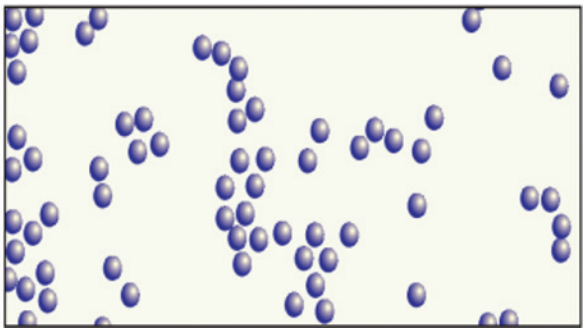
Types of Microorganisms

Bacteria	Fungi	Protozoa	Viruses	Archaea
• Lactobacilus used for curd and dough	• Saccharomyces family • used in dough and beverages for fermentation	• Irrelevent in bakery production	• Irrelevent in bakery production	• Irrelevent in bakery production

Fig. 3.6: Types of microorganisms



Rod shaped bacteria



Spherical shaped bacteria

Fig. 3.7: Shapes of bacteria

Spoilage in Baked Products

Bakery products are the staple foods in many countries. Bakery products and cereals are a precious source of nutrients. Variety of breads and other bakery products consumption has increased tremendously in India. Bakery goods are prone to spoilage. These include physical, chemical and microbial spoilage. The biggest factor of the spoilage of bakery products is microbial spoilage.

Some of the major causes of microbial spoilage due to the growth of bacteria and fungi along with the appearance of the spoiled product are given in the table below.

Bacteria involved in spoilage of baked products

Type of bacteria	Type of food spoiled	Appearance of the spoiled products
Bacillus	Breads, Cakes, Pastries	Slimy
Clostridium	Breads	Rotten along with unpleasant smell
Lactobacillus	Breads	Rotten along with unpleasant smell
Leuconostoc	Breads, cakes	Black spots on the product
Staphylococcus aureus	Pies	Slimy
Salmonella	Frozen pizzas	Rotten along with unpleasant smell

Fungi involved in spoilage of baked products

Type of Fungi	Type of food spoiled	Appearance of the spoiled products
Aspergillus	Bread	Black spots on the surface
Cladosporium	Breads	Brown or black spots
Penicillium	Breads	Blue-green mold
Saccharomyces	Breads and Pastas	Colour changes from white to yellow

Practical Exercises

Activity 1

Visit a nearby bakery production unit to enquire about the microbes used in their products.

Activity 2

Ask the baker to show you a bakery product which has characteristics of microbial growth.

Check Your Progress

A. Multiple Choice Questions

1. Bread dough is fermented using _____.
   (a) *Saccharomyces cerevisiae*
   (b) *Lactobacilus*
   (c) *Clostridium*
   (d) *Leuconostoc*
2. Blue green mold appearance on bread is caused by_____.
   (a) *Penicillium*
   (b) *Lactobacilus*
   (c) *Clostridium*
   (d) *Leuconostoc*
3. The biggest factor of the spoilage of bakery products is_____.
   (a) *Microbial spoilage*
   (b) Physical
   (c) Chemical
   (d) All of the above

4. Saccharomyces causes the change in colour of breads from white to _____.
   (a) Black
   (b) Yellow
   (c) Brown
   (d) Green

B. Mark the statement True or False

1. Microbes are present everywhere in soil, water, air and even inside our body.
2. Microbes can only be seen under a microscope.
3. The puffed-up appearance of dough is due to the production of O_2 gas.
4. Slimy appearance of pies is caused by Bacillus.
5. Saccharomyces is a bacteria.

C. Fill in the blanks

1. _____ are minute, unicellular organisms that are invisible to the naked eye.
2. The dough, for making breads, buns, paav is fermented by a fungus called _____.
3. _____ is used in the preparation of curd.
4. Rod shaped and _____ shaped are two shapes of bacteria.
5. Black spots on the surface of the bread are due to _____.

SESSION 3: HANDLING AND DISPOSAL OF CONTAMINATED BAKERY PRODUCTS

Bakery waste management includes the recycling or disposal of spoiled and expired bakery items such as breads, cakes, spoiled dough, etc. Bakery wastes are a combination of different wastes which further complicates the problem of their proper disposal. In this session, we will study about the handling and disposal of contaminated bakery products.

Disposal of Bakery Waste

Bakery waste is segregated into dry waste and wet waste. The expired and spoiled bakery products are disposed of by following the given methods.

1. **Recycling** — It is being adopted by various companies to save costs.
2. **Using as cattle feed** — Bakery wastes are considered to be comparatively safer than other food wastes. These can be sold to suppliers dealing in cattle feed.
3. **Using for industrial fermentation** — Bakery wastes may also provide valuable and readily hydrolysable feedstock. Other waste like rancid fat and oil, used oil from machinery is sold to recyclers.

SESSION 4: SHELF LIFE EVALUATION

Ideally, a bakery product is best for consumption after it is ready. You must have heard the idiom 'selling like hot cakes' which means that people always like freshly baked items. Due to population increase and changes in lifestyles, it is not always possible for people to have access to freshly baked items. To respond to these challenges, the companies came forward with many additives and preservatives to increase the shelf life and freshness of the bakery products. In this session, you will learn about the shelf life of various bakery products and some of the subjective evaluation parameters employed for this purpose.

Shelf life

It is the time duration for which the food products remain safe and fit for consumption and having features of desired sensory, chemical and physical characteristics. Numerous factors such as pH, moisture content, packaging, storage, and use of preservatives affect the shelf life of bakery products.

Shelf life of bakery products varies from product to product depending on its composition, moisture content and its condition of storage.

For example, bread has shorter shelf life due to high moisture content whereas cookies have longer shelf life due to low moisture content in it. Similarly, if bread is stored at higher temperature, it will have shorter shelf life than the same bread stored at low temperature.

Staling of bakery product

A bakery item begins to stale after it is prepared. Staling decreases consumer desirability to purchase or consume the bakery product. For example, if the shelf life of bread is five days, it also means that the bread progressively stales to its maximum extent up to the end of the shelf life. It also means that the desirability of one day stale bread is more than that of a four-day old bread. Staling in bread can be identified by the changes in its texture, taste and aroma.

Factors Affecting Shelf life of Baked Products

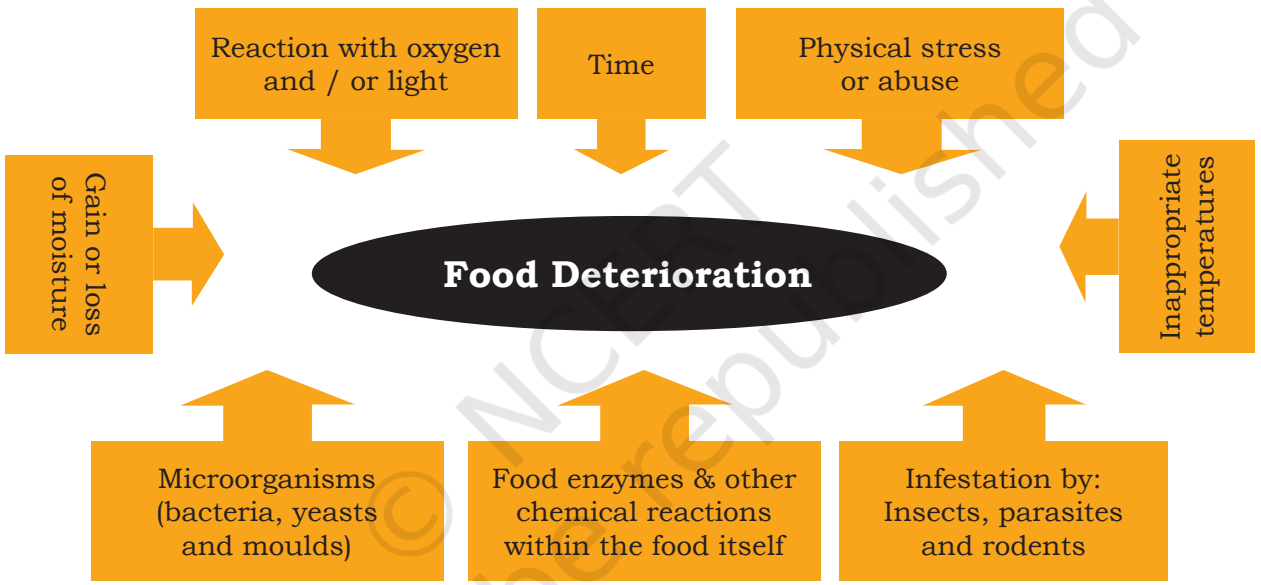


Fig. 3.8: Factors affecting shelf life of bakery product

Extending shelf life of bakery products

Shelf life extension is a set of methods to keep food safe for long periods, still maintaining its original quality. Various factors affecting the shelf life of the bakery products are shown in Figure 3.9.

Advancements in recent bakery processing technologies and new ingredients innovation have led to significant shelf life extension. For example, breads and buns that traditionally lasted for two to four days now remain soft, springy and mold-free up to two weeks.

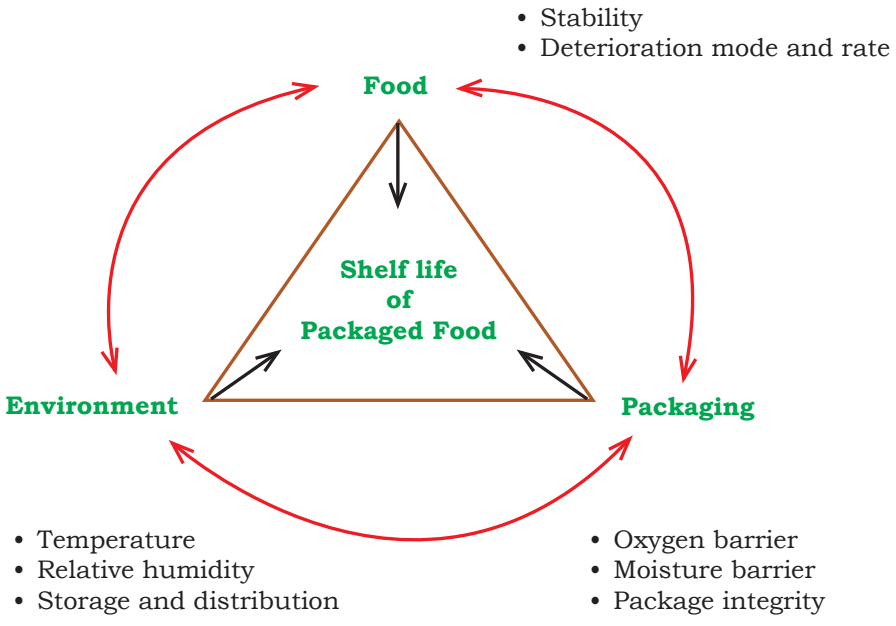


Fig. 3.9:Factors affecting the shelf life of bakery products

Shelf life of Some Popular Bakery Products

Shelf life of different bakery items is given in the table below.

S.No	Bakery Product	Shelf life	Refrigerated
1.	Bread	2–3 Days	Not recommended
2.	Cake	1–2 Days	2–4 Days
3.	Cake with fresh fruit	--	1–2 Days
4.	Cake with whipped cream	--	1–2 Days
5.	Packaged cookies	1–2 Months	--

6.	Cupcakes	1–2 Days	2–4 Days
7.	Pie	-	2–3 Days
8.	Baked puff pastry	--	1–2 Weeks

Techniques to Improve Shelf life

Physical method

The bakery industry has traditionally relied on the use of physical methods to extend the shelf life of bakery products. Ultraviolet light, IR radiation (Infrared radiation), UHP (Ultra High Pressure) are some of the techniques employed for that purpose.

Fig. 3.10: Bun being treated under ultraviolet light

UV light is a powerful anti-bacterial treatment and used to control the occurrence of mould and spores. Direct UV irradiation of the surfaces of wrapped bakery products increases their shelf life.

Chemical Treatments

Chemical preservatives such as calcium propionate, sorbate, benzoate, etc., are extensively used in bakery. These preservatives restrict and inhibit the growth of spoilage organisms, such as mold and rope bacteria.

Fig. 3.11: Sourdough starter

Sourdough

In olden days, bread with a long shelf life was obtained mechanically, using a traditional long process known as sourdough. It is prepared using a sourdough starter which is alive fermented culture. The live fermented culture is a natural leavening agent and is made from flour and water. Sourdough has a unique flavor, chewy texture and crisp, crackly crust.

Packaging

Packaging is meant to extend the shelf life of packaged foods and maintain or improve the condition of food by creating a barrier between food and any outer contaminants. Packaging also helps in communicating information about the products and prohibit the contact of food with any unfavorable conditions like moisture, air, etc.

Fig. 3.12: Sourdough bread

Practical Exercises

Activity 1

Visit a bakery production unit in your area.

1. Talk to the baker and ask about the shelf life of bakery products.
2. Ask for an expired baked product/bread and note down the comparative features of fresh and expired products.
3. Talk to the baker and ask about the preservatives used to increase the shelf life of the baked products.

Check Your Progress

A. Multiple Choice Questions

1. Sourdough has _____.
   (a) long shelf life (b) short shelf life
   (c) no shelf life (d) none of the above
2. Bread spoils very fast because of _____.
   (a) moisture (b) high pH
   (c) cold storage (d) sweet taste
3. After shelf life, the bakery products become _____.
   (a) unsafe for human consumption
   (b) safe for consumption
   (c) healthy
   (d) soft
4. Which is the chemical preservative for baked products?
   (a) Acetic acid (b) Ascorbic acid
   (c) Citric acid (d) Calcium propionate

B. Mark the statement True or False

1. Chemical treatment of the baked product improves shelf life of the product.
2. Packaging helps in preventing contamination of baked products.
3. Physical damage does not cause spoilage in baked products.
4. UV irradiation of the surfaces of wrapped bakery products increases their shelf life.

C. Fill in the blanks

1. Shelf life of bread is _____ days.
2. Sorbate is a _____ for baked products.
3. UV light is an _____ treatment used in baking.
4. Packaging is meant to extend the _____.

Pre-preparation and Baking Products in the Oven

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Before actual baking, certain pre-preparations like cleaning the workplace, measuring ingredients, preheating oven, etc., are carried out. The pre-preparation activities undertaken before, during, and after production stage are collectively called as a 'Work Plan'. A work plan includes the name of the specific product to be made, formulating its recipe, listing the required ingredients, tools and equipment, and organising the workspace. In this Unit, we will discuss about the pre-preparations involved in achieving the final baked product.

Session 1: Baker's Math

In baking, the process of increasing or decreasing ingredients of a recipe to adjust the yield is known as scaling. There are many methods of scaling a recipe to make the desired number of pieces of a product. It is important to learn baker's math in order to scale a recipe. Baker's Math involves baker's percentage, simultaneous equation and ratios being widely used in the industry. Various calculations that come under baker's math are given as follows.

Baker's Dozen

A Baker's dozen has 13 numbers in contrast to standard dozen which has 12 number of units. For example, if someone asks a baker to give baker's dozen of bread loaves, the bakers would give 13 loaves. The baker's dozen originated in England to prevent the customer from being cheated. The baker in England used to give an extra loaf for every dozen purchased to make up for any potential shortfall.

- Baker's per cent
- Ratios
- Simultaneous equation

Baker's per cent

Baker's per cent is a mathematical method widely used in baking to calculate the amounts of ingredients. In baking formulas primarily based on flour, each ingredient's weight is measured as a percentage of the total flour weight (100%).

Ratios

In baking recipe, an ingredient of a recipe has relationship with other ingredients present in the recipe. Changing one ingredient or its quantity will affect the other ingredients, presence in the recipe. It is because of chemical reactions occurring due to the interaction of ingredients in baking. This relationship between ingredients is called ratio in bakery science. Over or under estimation of ingredients can spoil the product, especially when it comes to cakes, bread and biscuits. Therefore, ingredients need to be in exact proportions to interact properly.

For example, if a recipe needs 3 cups of flour and 2 cups of sugar, the relationship between the two ingredients is 3 parts is to 2 parts. The ratio is expressed as 3/2 or 3:2.

Simultaneous equation

It is an important method to scale your recipe up or down based on the number of pieces of product you want to make.

Example — A bread recipe where the total weight is 5 kg and gives you 5 breads of 1 kg each can be scaled up to give you 10 or 20 breads. Similarly the same recipe can be scaled down to give you 1 or 2 breads too.

In order to get the right measurement, you can look at the given formula.

Recipe of White Bread	
Flour	1000 gm
Water	600 ml
Sugar	50 gm
Salt	20 gm
Yeast	30 gm
Total weight	1,700 gm
Yield (Output)	2 raw bread dough of 850 gm each*

*Note: After baking the breads will be reduced in net weight by roughly 15%. However, you always take the raw weight into consideration while making the bread, then after baking you mention the final net weight on the packet.

Similarly, to get the recipe for one loaf, we need to divide the above ingredients by 2.

Now suppose you have an order for 50 breads, to calculate the amount of each ingredient to make 50 breads, you will proceed in the following way:

We got two bread loaves from the above quantities. Now to get quantity of each ingredient for 50 bread loaves we need to divide the quantities by 2 and multiply by 50. (1÷2×50=25) So we need to multiply each ingredient by 25 to get the recipe for 50 bread loaves.

Flour	1000 gm × 25 = 25000 gm / 25 kg
Water	600 ml × 25 = 15000 ml / 15 L
Sugar	50 gm × 25 = 1250 gm/ 1 kg 250 gm

Salt	20 gm × 25 = 500 gm/ .5 kg
Yeast	30 gm × 25 = 750 gm/.75 kg
Total weight	**42.5 kg**
Divide 42.5 by .850 (weight per bread) = you will get 50	
42.5/.850 = 50 bread loaves	

Important tables of conversion of weight and volume

Table 4.1 Weight Conversion Table Kilogram to gram

Kilogram (Kg)	100 gram (gm)	10 gram (gm)	1 gram (gm)	0.5 gram (gm)
1	0.1 kg	0.01kg	0.001kg	0.0005 kg

For example, 1100 gm can be written as 1.1 kilogram and vice-versa or 1120 gm can be written as 1.120 kilogram and vice versa.

Table 4.2 Volume Conversion Table Litre to Millilitres

Litre	100 millilitre (ml)	10 millilitre (ml)	1 millilitre (ml)	0.5 millilitre (ml)
1	0.1 Litre	0.01 Litre	0.001 Litre	0.0005 Litre

For example, 1100 ml can be written as 1.1 litres and vice-versa or 1120 ml can be written as 1.120 litres and vice versa.

Time and Temperature

Temperature plays a vital role in baking the products in the oven. Different products need different temperature depending upon weight and size of the product being baked.

Each type of product has varying time and temperature in different types of ovens. By regularly using and practising the recipe, you will be able to understand time and temperature combination. For example, an 850 gm bread loaf will take 50 minutes at 180° centigrade temperature but 400 gm bread can be baked for 30 minutes at 200° centigrade. Some recipes mention Degree Fahrenheit and some mention Degree Centigrade. In India most common temperature scale is Degree Centigrade. In order to convert Fahrenheit into Degree centigrade you need to use this formula.

(32° F – 32) × 5/9 = 0° C.

So if the Fahrenheit is 300 then (300° F – 32) × 5/9 = 148.889° C Or 149° C

Note: The thumb rule to ascertain baking time and temperature is that 'the larger the volume of the product in the pan the lower the temperature and longer the time'.

For example, you can bake a 500 gm chocolate cake batter in a 9" pan at 180 degree for 30–35 min. But if you are baking the same 500 gm batter in a larger pan, say 12", then the height of the batter is reduced as it spreads into 12" surface. You can keep the same temperature but reduce the time to 20–25 minutes.

Similarly, if you bake the same 500 gm cake batter in a 6 inch pan, then the height of the batter is increased (its thicker) and so you will need to reduce the temperature to 160 degree and increase the time to 45–50 minutes so that the heat can penetrate properly into the batter to fully cook it. But if you keep the temperature at 180 and bake for 50–55 minutes, then the top and bottom might be cooked and may get burnt as well but the centre will remain uncooked.

Practical Exercises

Activity

Scale-up the given bread recipe in the unit for 60 bread loaves using simultaneous equation.

Check Your Progress

A. Multiple Choice Questions

1. The baker's dozen originated in _____.
   (a) England (b) Greece
   (c) India (d) Italy
2. Baker's percent is widely used in baking to calculate the amount of _____.
   (a) ingredients (b) sugar
   (c) flour (d) fat
3. Changing one ingredient affects the presence of other ingredients in the recipe due to _____.
   (a) chemical reactions
   (b) shortage of ingredients
   (c) evaporation
   (d) None of the above
4. 2.3 kilogram can be represented in gram as _____.
   (a) 2300 g (b) 230 g
   (c) 0.230 g (d) 23000 g

B. Mark the statement True or False

1. Over or under estimation of ingredients can spoil the bakery product.
2. In baking, each ingredient's weight is measured as a percentage of the total flour weight (100%).
3. Temperature of the oven has no role in baking of the product.
4. Degree Centigrade and Degree Fahrenheit are used to represent temperature.
5. When the volume of the product is large, the product is generally baked at a higher temperature for a shorter duration.

C. Fill in the blanks

1. _____ has 13 numbers in contrast to standard dozen which has 12 number of units.
2. The pre-preparation activities undertaken before, during, and after production stage are collectively called _____.
3. The process of increasing or decreasing ingredients of a recipe to adjust the yield is known as _____.
4. Relationship of one ingredient to another ingredient is called _____.
5. _____ is used to scale up or scale down a recipe.

SESSION 2: WORK PLAN OF BAKING

Depending upon the kind of kitchen (domestic, commercial or factory kitchen) where baking is being carried out; the following pre-preparatory activities are conducted to achieve the final product.

Pre-production Sequence

Defining the product

A product is defined through a document called menu. A menu contains information about the various products for sale by a bakery. Defining a product in a menu is based on the following parameters of the products as shown in Figure 4.1.

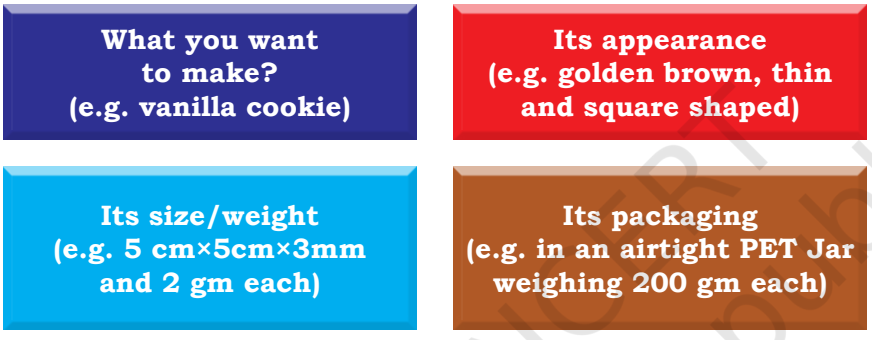

Fig. 4.1:Parameters of defining a product

Listing the required tools and equipment

After defining the product, various tools and equipment are arranged to make the product. For example, some of the tools and equipment required to make vanilla cookies are shown here.

Tools	Equipment
Baking tray	Planetary mixer
Scraper and spatula	Weighing scales
Knife	Oven
Square cookie cutter	Cooling rack

Creating a recipe sheet

A recipe sheet is a written document of the ingredients and method to prepare the particular product with uniformity. The recipe sheet differs from product to product. After defining the product and listing the tools and equipment, the recipe sheet is prepared listing all the ingredients, their quantities, baking time, baking temperature, weight of the raw and finished product, its portion size, its photograph and the method followed to achieve the desired product. A recipe is generally finalised after a series of trials and once the desired result is obtained the recipe is standardised and is not changed without the approval of a concerned authority.

Steps in finalising a recipe

1. Repeated trials of the product by preparing the same through the recipe sheet.
2. Keeping records of each trial with all details like shape, size, weight, baking time and temperature, etc., make and do necessary changes to the recipe if the desired results are not achieved.
3. Once the desired result has been achieved then make final changes to the recipe and record it in an excel sheet in the computer or note it down in your recipe notebook.
4. Click photo and paste the recipe sheet for complete consistency.

Recipe Sheet for "White Bread"

Recipe Name: White Bread
Weight Per Raw Portion of the Dough: 800 gm
Yield: 2 loaves of 750 gm each
Baking Time: 35 minutes
Baking Temperature: 200° C

Qty	Unit	Ingredients	Method of Preparation
1	Kg	Flour	1. Mix all the ingredients in the dough machine except the oil. Knead on a low speed for 3 minutes and then on high speed for another 5 minutes. 2. Add oil and knead again for 3–4 minutes at high speed. 3. Once the dough is smooth and leaves the sides of the bowl, turn off the machine and remove the dough out of the mixing bowl.
0.025	Kg	Castor Sugar	
0.03	Kg	Yeast	

0.001	Kg	Salt
0.55	L	Water
0.025	L	Oil
1.606	**Kg**	**Total Weight**

4. Cover and give it a bench rest of 30 minutes. Scale/ Cut the dough into 800 gm pieces.
5. Fold and shape the dough into a ball, cover and keep for another 15 minutes. Knock back. Fold, shape and place the dough into the bread mould.
6. Proof for 1.5 hours in the proofer at room temperature.
7. Poke the dough with your finger to check if it has been proofed.
8. Once proofed, place in the oven at 200 degree for 20 minutes. After 20 minutes, turn the baking tray and bake again for 20 minutes
9. After baking, remove the bread from the oven, empty the bread from the mould/pan, and place it on the cooling rack. Once it is cooled completely, slice and pack it.

Organising the work space

After creating the recipe sheet, ingredient list and equipment list, a baker is ready to organise raw material that is needed for production of the products. The baker must organise storage containers (Pet jars, bowls, pans, etc.), storage shelves and space to accommodate all the raw material. You must clean and sanitise your work table, baking tools and equipment and place them at respective areas. This helps the baker to ascertain safe production practice and leads to efficiency in the work.

Procure all the raw materials from the main storeroom or the market and store them in respective containers for daily use. Once the baker has all the ingredients at his disposal, they then go to the next stage of weighing all the ingredients mentioned in the recipe sheet.

Fig. 4.2: Weighing of the flour

Weighing and scaling a recipe

Once all the ingredient containers are organised, the baker goes through the recipe sheet and starts measuring the ingredients in the recipe to produce a certain number of pieces of a product. Depending upon the need, they can scale (calculate and measure) the recipe in higher or lower doses.

Fig. 4.3: Setting oven temperature with the knob

Fig. 4.4: Kneading

Setting up oven temperature

Once the recipe is measured or scaled and measured, the baker turns on his oven and sets the required temperature to pre heat the oven before actual manufacturing of the product starts.

Production sequence in baking

Mixing and kneading

After all the ingredients are measured, they must be be put into the respective machinery for processing. Depending upon the instruction in the recipe the ingredients are either creamed, mixed, kneaded or whipped, etc. Follow instructions in the recipe carefully to avoid spoiling the finished product.

Resting and proofing

Once the mixture is mixed or kneaded, it goes into the next step of resting (in case of cookie, cracker, tea cake, etc.) or resting and proofing both (in case of breads, etc.)

Baking

Once the resting and proofing is complete, the product is either shaped (e.g. Cookie dough is rolled and shaped) or directly prepared for baking into the oven (e.g. Breads). Recheck the temperature and put the product into the oven for baking.

Fig. 4.5: Resting of the dough

Fig. 4.6: Bread loaves after baking

Post-production sequence

Cooling and storing

Once the product is baked, it is allowed to cool and after cooling, it is packed and stored as per the storage policy.

Let us understand through an example of the detailed work plan for biscuit preparation.

Detailed work plan for production of biscuit		
Time (Involves dividing time for each activity)	Steps (Steps to be performed to prepare the biscuit)	Equipment (List of ingredients, tools and equipment required)
Stage 1: Pre-production Sequence		
Start time **1:35 pm**	Put on apron, wash hands, define product to be made, refer to recipe, collect ingredients and equipment as per the recipe sheet. Clean the planetary mixer and attach the pedal attachment.	Ingredients — flour, sugar, butter, baking powder Utensils, tools and equipment — Baking tray, Planetary mixer, weighing scale, knife, bowls, rolling pin, spoon Sieve, Biscuit cutter, Grease proof paper, cooling tray, hand gloves, Cooling tray, Hand gloves, Airtight container, Dishwashing soap, Scrubbers
Stage 2: Production Sequence in baking biscuit		
1:45 pm	Cream butter and sugar together till a smooth consistency is obtained, add the dry ingredients and mix them slowly to obtain a firm dough. Chill the dough in the fridge for 1 hour.	
3:00 pm	Roll the dough on a dusted marble top.	

3:05 pm	Cut with a biscuit cutter.
3:15 pm	Place grease proof paper on a baking tray and bake the biscuits.
Stage 3: Post-production Sequence in baking biscuit	
3:45 pm	Cool the biscuits for half an hour or as per the recipe.
4:15 pm	Clean the utensils and equipment used in preparation while the biscuit is getting cool.
4:30 pm	After cooling, pack and store as per the storage policy.

Processes used in Baking

Baking a product involves many processes like shortening, leavening, fermentation, proofing, etc. For bread preparation, leavening and proofing processes are crucial whereas, shortening plays a crucial role in biscuit and cake preparation. Therefore, it is essential to know when a particular process has to be used.

Shortening and rubbing-in

Why it is called shortening?

The term 'shortening' means 'keeping short'. Shortening shortens the gluten strands in dough and batter, thus making the product tender.

The process of shortening is used in bread dough and flaky pastry dough preparation. Shortening is a process of adding edible fats (also called shortening agents) like oil, butter or margarine, etc., while preparing the dough before baking the product. The type and quantity of shortening agent to be used varies from product to product. For example, shortening agent like oil and butter is used in baking bread dough. Oil, butter or margarine is also used in baking tea cakes or sponges. However, the technique of shortening used in dough making (bread dough, short crust pie dough, puff dough, biscuit and cookie dough) varies.

In a yeast bread dough preparation, a small amount of shortening agent improves the gluten extensibility and help in producing good volumes. On the other hand, preparation of biscuits, cookies and pastries

require higher quantities of shortening agents ranging from 60 to 80 per cent approximately.

Creaming

The technique of softening the shortening agents like solid fat or butter into a smooth mass and blending them with other ingredients like sugar, flour, etc., is called creaming. During creaming process, air is entrapped into the shortening agent which expands when heated during the baking process. The overall impact of creaming is that it gives volume to the bakery product. This technique is most often used in making cake batter, cookie dough, butter cream, etc.

Whipping

The process of beating an ingredient vigorously so that air can be incorporated into it which in turn makes it frothy or foamy is called whipping. It is done with the help of a wire whisk by hand or by machine. For example, when egg whites are beaten, they become fluffy and foamy because of the trapped air in it. The air incorporated during whipping of eggs expands when the batter is baked and causes the cake to rise. Sponge cake is an example of cakes leavened by whipping. Another example is whipping cream which upon whipping doubles or triples its volume.

Fig. 4.7: Beaten egg white

Mixing or blending

Mixing is the process of combining more than one ingredients together.

(a) Dry mixing: Combining more than one dry ingredient together like mixing flour, cocoa powder and baking powder together with the help of a sieve or spatula.

(b) Wet mixing: Combining dry ingredients like flour, sugar powder are mixed into wet ingredients like butter and eggs or vice-versa or combining more than one wet ingredients together with the help of a whisk or spatula.

Kneading

Kneading is the process used in leavened and unleavened dough making. Dry ingredients such as flour are mixed with liquid ingredients like milk, water, eggs, etc., with the help of hand or machine to develop gluten in the dough which adds strength to the final product. For example, chapatti dough, naan dough, bread dough, puff dough, etc.

Leavening process

Leavening process raises and increases volume in bakery products like cakes, breads, cookies, etc. It gives shape and adds texture to the product.

Any process by which dough or batter is filled with gas holes, which are retained upon baking, is a leavening process. In short, it is production or incorporation of gases into the batter and dough before baking the product.

Different chemical leavening agents are:

1. Baking soda
2. Ammonium bicarbonate
3. Baking powder

Chemical leavening agents are used in cakes, sponges, cookies, muffins, etc.

Different biological leavening agents are:

1. Baker's yeast
2. Sour dough (naturally produced yeast culture)

Biological leavening agents when added to dough, initiate fermentation by acting upon sugars present in ingredients of the dough. They are primarily used in bread preparation.

Fermentation

Fermentation is the process in which yeast in the dough feeds upon the sugar present in ingredients in the dough and releases carbon dioxide and other gases leading to the rise of the dough. It is done in breads dough.

1. Bulk fermentation: After the dough is made, it is allowed to rest on the work table undisturbed for a specific time.
2. First fermentation: It is then cut into portions, shaped and allowed to ferment for a specific time. It is then knocked back and reshaped. The dough is now ready for second fermentation or proofing.
3. Proofing: The knocked back and shaped dough is placed in baking pan for proofing. Proofing is also called 'final fermentation', which means allowing

dough to rise after it has been shaped and before it is baked. Proofing is done in a humid environment between 25° to 35°C temperature and for a specific time. Slow proofing takes 10–12 hours whereas fast proofing takes 1–2 hours.

Properly proofed dough will further rise in the oven during baking process, which will give good volume, texture and taste to the baked product.

The 'finger poke method' is used to judge the dough for correct proofing. In this method, the dough is poked by the finger, if it springs back immediately it is under proofed and needs more time.

Fig. 4.8: Dough before proofing

Fig. 4.9: Dough after proofing

Baking

Baking is the final step where the proofed dough is placed in the preheated oven at a certain temperature for a certain time. While baking, the dough further gains the volume, texture, structure, shape and colour. Once it is completely cooked, it is removed from the oven and allowed to cool. It can be consumed immediately or stored for later usage.

Types of Bread and Pastry Dough

Bread dough and pastries dough can be categorised into five types.

Yeast dough

This type of dough is a combination of flour, sugar, yeast, fat, salt, egg or milk and water. Different types of yeast dough are made using all or few of these ingredients. Example — bread dough, pizza dough, baba dough, brioche dough, etc.

Short crust pastry dough

Flaky pastries are made from the short crust pastry dough which is a combination of flour, butter, sugar and eggs and is made by employing either the creaming or rubbing-in technique. Examples of products using this type of dough are apple pie and fruit tart.

Puff pastries dough

This type of dough is a combination of flour, water, salt, vinegar or lemon juice and butter or margarine. The puff pastry dough is used for making khari, fan, patties, *vol-au-vent*.

Leavened puff pastries dough

This type of dough is a combination of flour, water, salt, sugar yeast, butter or margarine. The dough is further laminated (a technique of multiple layering of dough and fat) with butter or margarine. It is commonly used to prepare croissants, danish pastry, cinnamon roll, etc.

Choux pastries dough

This dough is a twice cooked dough. This type of dough is a combination of flour, water, salt, butter, sugar and is usually first cooked over flame and afterwards eggs are added to create a paste like dough. The dough is then put in a piping bag and piped on to baking trays and baked. We will learn more about this dough in Class X Baking Technician textbook.

Practical Exercises

Activity 1

Prepare a work plan for bread preparation covering all the steps given in the session.

Activity 2

Demonstration of shortening, leavening, fermentation and proofing processes.

Check Your Progress

A. Multiple Choice Questions

1. During creaming process, _____ is entrapped into the shortening agent which expands when heated during the baking process.
   (a) air (b) moisture
   (c) heat (d) None of the above
2. Proofing is also called _____.
   (a) First fermentation (b) Final fermentation
   (c) Bulk fermentation (d) Second fermentation
3. Correct proofing of the dough is judged by_____.
   (a) punching the dough (b) finger poke method
   (c) chemical testing (d) visual inspection
4. Slow proofing takes 10–12 hours, whereas fast proofing takes _____.
   (a) 1-2 hours (b) 2-3 hours
   (c) 4-5 hours (d) 20 minutes
5. Flaky pastries are made from the_____.
   (a) Short crust pastry dough
   (b) Yeast dough
   (c) Puff pastries dough
   (d) Leavened puff pastries dough

B. Mark the statement True or False

1. A recipe is generally finalised after a series of trials.
2. Shortening plays a crucial role in biscuit and cake preparation.
3. Choux pastry dough is a thrice cooked dough.
4. Choux pastry dough is used for making khari, fan, patties and *vol-au-vent*.
5. Proofing is done in a humid environment between 25° to 35°C temperature and for a specific time.

C. Fill in the blanks

1. A product is defined through a document called _____.
2. A _____ is a written document of the ingredients and method to prepare the particular product with uniformity.
3. Leavening and proofing processes are crucial in _____.
4. _____ shortens the gluten strands in dough.
5. Any process by which dough or batter is filled with gas holes, which are retained upon baking, is a _____ process.

Session 3: Types of Dough and their Methods of Preparation

Perfect dough is needed to get the desired bakery product. Therefore, we will first discuss in this session, the different types of dough and the methods of preparing them. Further the types of products made from yeast and non yeast dough are discussed.

Yeast Dough Preparation

The common steps for preparation of yeast dough of different types are given below in Figure 4.10. Yeast dough is used for preparing breads, *paav*, buns and pizza.

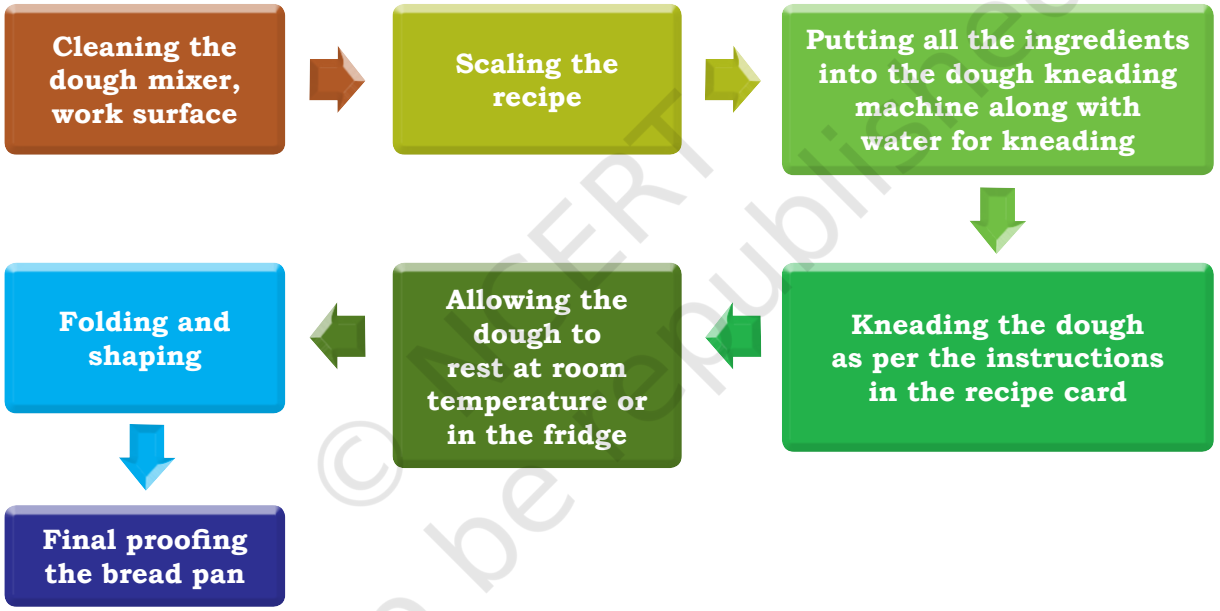

Fig. 4.10: Steps of basic yeast dough preparation

Methods for yeast dough preparation

Bakeries adopt various techniques to produce different varieties of bread having different taste and texture.

Straight dough method

This is the simplest and most popular method used in production of bread. As the name suggests, in this method all the ingredients are mixed together, and the dough is fermented for a predetermined period.

Salt-delayed method

In this method, all the ingredients are mixed except salt and fat which are added during later stage of kneading. Only three-fourth (of the actual mixing time) mixing should be given initially and then salt and fat is added and remaining one-fourth mixing is done. The method is especially suitable if strong flours are to be used for bread making by straight method. As the salt has a controlling effect on enzymatic action of yeast, the speed of fermentation of dough without salt will be faster and gluten is matured in a reasonably shorter time.

No-time dough method

In this process, ingredients are mixed vigourously to produce a dough ready for direct scaling, shaping and one final proofing. In no-time dough, production of gas and conditioning of gluten is achieved by increasing the quantity of yeast (2 to 3 times of the original quantity). Generally, the product made using this method has less volume, dry crumb and lacks aroma. Due to the absence of fermentation, the gluten and starch are not conditioned sufficiently to retain the moisture and there is no flavour because flavour producing by-products of fermentation are absent. As there is increased quantity of yeast present, the bread may have a strong yeast flavour also.

Ferment and dough

Ferment is an equal proportion of water and flour and tiny quantity of yeast to make a thin batter. In the first stage, the ferment yeast is blended into a thin batter and fermented with about 20 per cent of the flour and with all the water.

In the second stage, the first ferment is blended with the rest of the flour, salt, fat and milk powder to form dough. This is the second or the dough stage and is bulk fermented for roughly the same time as the ferment. The dough can then be scaled, proofed and baked. This method is used for making enriched bread, buns, Danish pastry, sweet dough, doughnuts, etc.

Sponge and dough method

In this method, as a first step, a part of flour, proportionate amount of water, yeast and sugar are

mixed together. Longer fermenting sponges may contain some amount of salt also. Mixing operation is carried out just sufficiently to incorporate all the ingredients evenly. This sponge is fermented for a predetermined time. Sponge fermentation time depends on the amount of flour in the sponge and flour quality. The quantity of flour in sponge depends on the strength of flour. When the sponge is ready, it is broken down with formula water, so that its evenly mixing in the dough is assured. Broken down sponge is mixed with the remaining flour, sugar, salt, fat, etc. After the dough is mixed, it is rested for 30 to 45 minutes during which time it relaxes from the stress of mixing operation. For example, sour dough bread.

Non-leavened Doughs Preparation

Flaky Pastry Dough or Short Crust Pastry Dough

Flaky pastry dough or short crust pastry dough is used for biscuits, short crust cookies and pie preparation. Gluten development in the flaky pastry dough is undesirable. These doughs are light textured and non-elastic. Rubbing and creaming technique is used to prepare non-elastic and crumbly dough.

- **Rubbing in** — Here the butter is incorporated to the flour, then the sugar and eggs are mixed to form the dough.
- **Creaming** — Here the butter, sugar and eggs are beaten together and then the flour is folded in to form the dough.

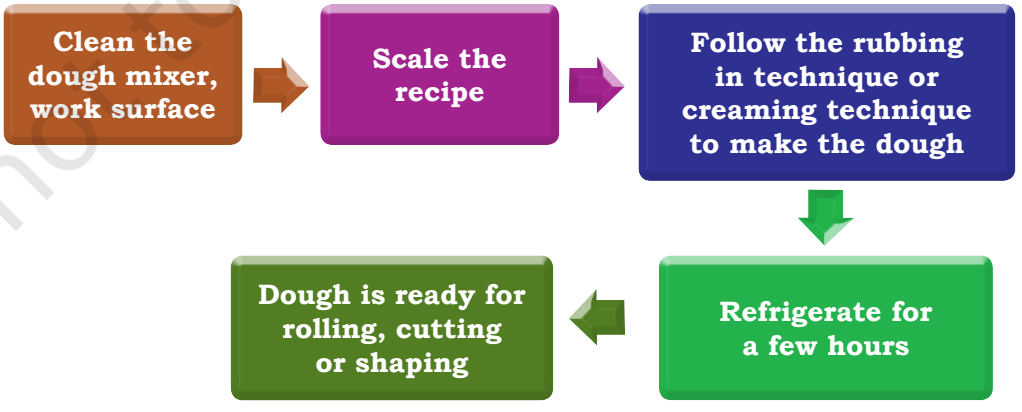

Fig. 4.11: Steps for flaky pastry dough preparation

Puff pastry dough

It is a combination of flour, water, salt, and vinegar or lemon juice and butter. The dough is laminated with margarine. Fan, Khari, Patties, Vol-au-vent, etc., are prepared using puff pastry dough. Steps to prepare the puff pastry dough are shown in Figure 4.12.

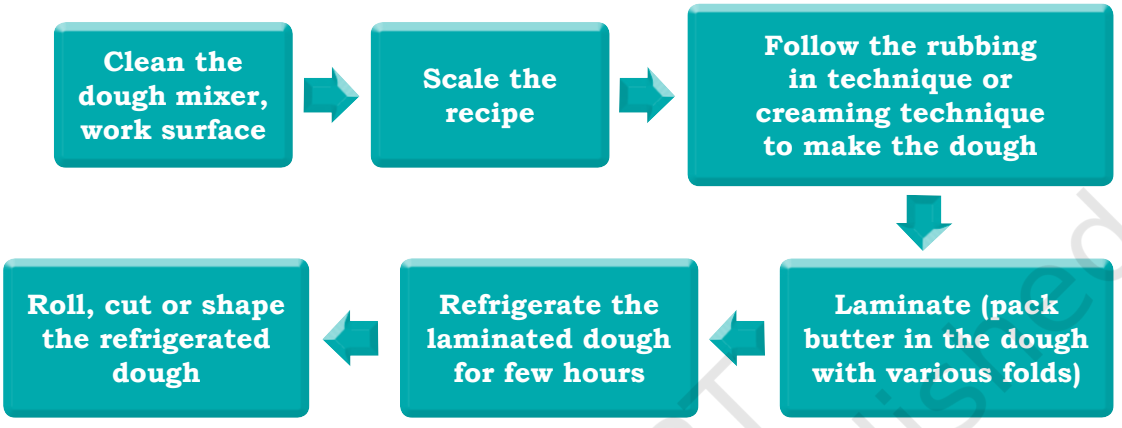

Fig. 4.12: Steps for puff pastry dough preparation

Leavened Puff Pastries Dough Preparation

It is a combination of flour, water, salt, sugar, yeast, butter or margarine. The dough is laminated (a technique of multiple layering of dough and fat) with butter or margarine. It is commonly used to prepare croissants, Danish pastry, Cinnamon roll, etc.

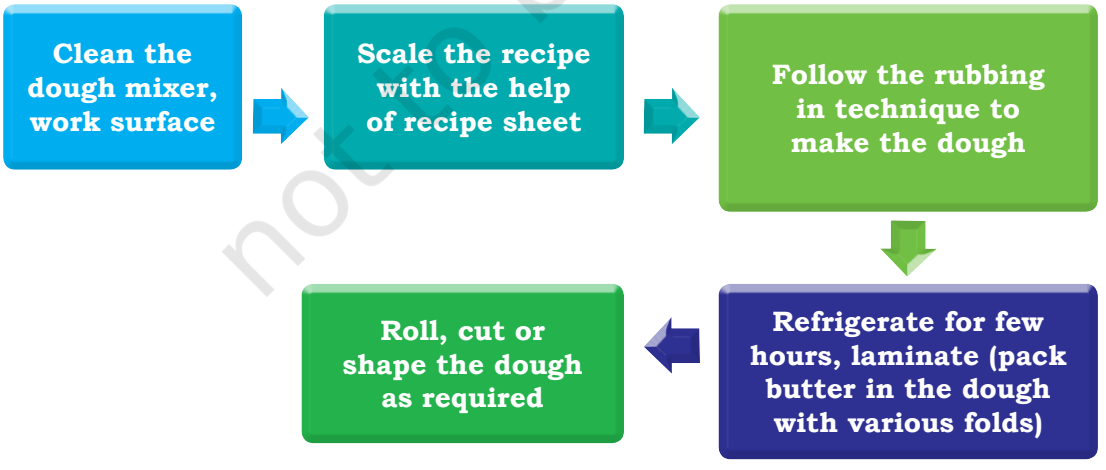

Fig. 4.13: Steps for leavened puff pastries dough preparation

Bread Preparation

Bread is one of the most familiar products among all bakery products. You can find bread at every bakery shop and general stores. Bread has become secondary staple food after puri, chapatti and rice due to its popularity and ease of consumption. Bread making requires understanding of the science behind the usage of ingredients, temperature, time duration and the processes involved. Bread, is prepared by dough of wheat flour and water, seasoned with salt and raised by the action of yeast and then baked in an oven. Many variations to this basic bread can be made using different types of flours, e.g. whole meal flour, barley flour, etc., techniques and shapes. Bread is highly perishable and dough is an important stage in the making of the bread.

Breads are made by a fermentation process in which yeast consume the sugar and converts it into carbon dioxide gas, water and alcohol.

Fig. 4.14: Process of fermentation

The sugar required for the action of yeast comes from the flour itself which contains 1% sugar, and any sugar added during preparation. The fermentation process requires sugar and proper conditions of temperature and humidity. It then results in gradual expansion of dough and finally it doubles in volume. In addition to yeast multiplication activity, the gluten of flour must be developed. It is the gluten which gives dough elasticity or stretchability which is necessary for rising in volume. During the kneading process, gluten is formed from the

proteins present in flour, on addition of water and salt. As bread rises during the fermentation process, the gluten stretches to form the cellular structure of the dough which should be light and porous.

Steps in bread preparation

The various stages involved in bread making are shown in Figure 4.15.

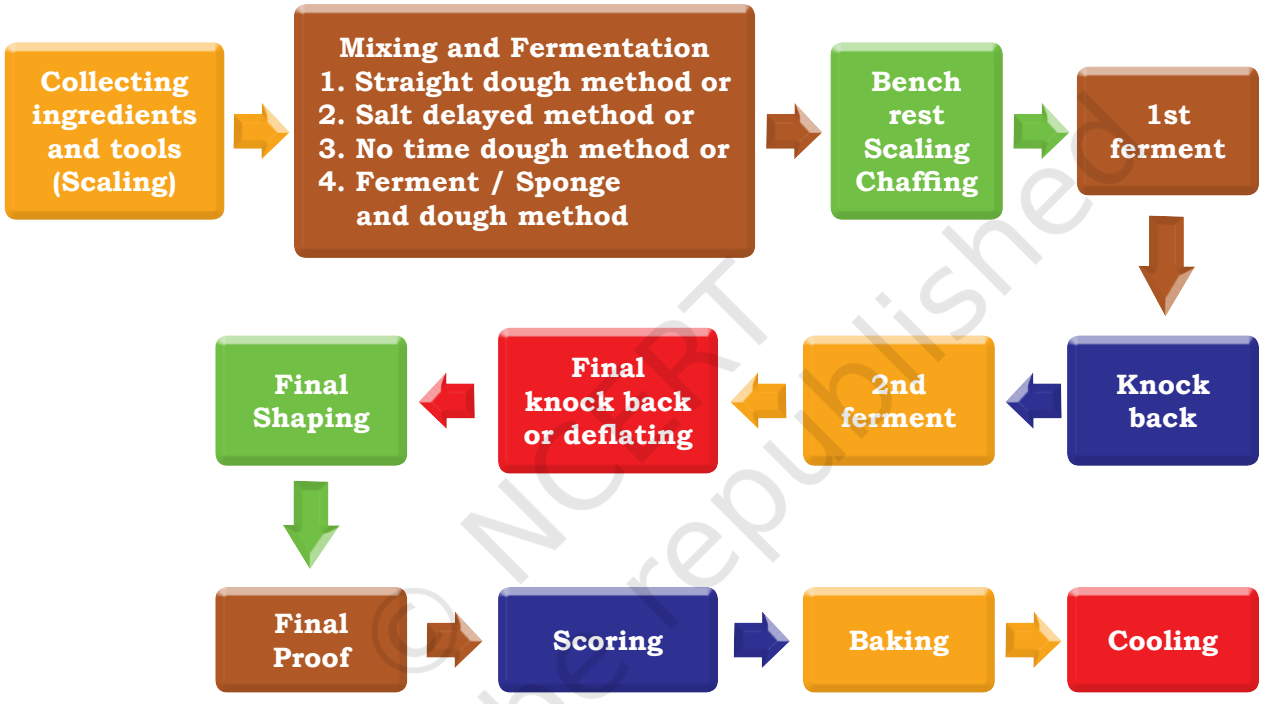

Fig. 4.15: Steps in bread making process

Biscuit and Cookie

You must have eaten biscuits and cookies and wondered about their composition which makes them so tasty. There are several varieties or types of biscuit and cookies having different taste, texture, and eating quality. Biscuit and cookies are the most popular pre-packaged ready to eat snacks in the world. Both biscuits and cookies look similar; however, they have some characteristic differences.

Biscuits	Cookies
Thin and light	Thick and heavy
Made from variety of flours, sugar, additives, flavours and fats	May have additional ingredients such as nuts and dry fruits, chocolate chip
Sweet/savoury and crispy texture	Sweet in taste and can have both crispy or crumbly texture
Made with high moisture content in the dough	Made with less moisture content in the dough
Low fat content in dough	Higher fat content in the dough
Stiff dough is used	Softer dough is used

Stages in Biscuit preparation

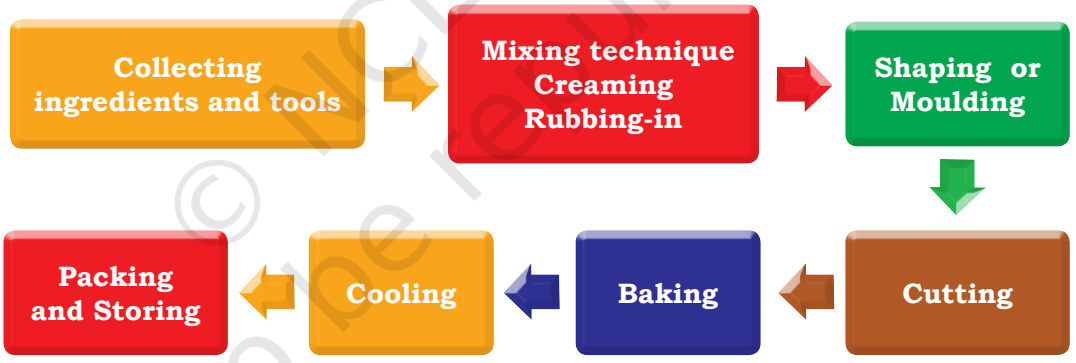

Fig. 4.16: Stages in Biscuit preparation

Naan Khatai

It is an Indian traditional biscuit made with chickpea flour, flour, hydrogenated vegetable fat, sugar and ghee. It is a rich biscuit made in various styles in different parts of the country.

Stages in cookies preparation

Various stages involved in cookies preparation are shown in Figure 4.17.

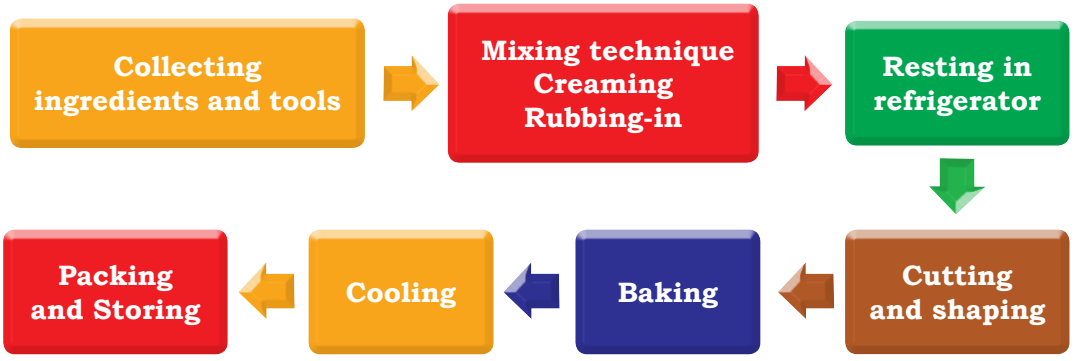

Fig. 4.17: Stages in cookies preparation

Faults in Bakery Products

There are many faults that can occur in the product which results in undesired product quality, taste, texture and shelf life. It is, therefore, important to follow all the instructions mentioned in the recipe to prevent any errors in the production process so that desired outcome is achieved. The following are types of faults that can be visibly seen in the baked products.

Flattened bread

This usually happens with breads that are not baked in a mould or tin. Example — burger bun, hot dog bun, bread rolls, etc. Following are the causes of the flat bread.

Causes

1. Under kneaded dough.
2. Improper shaping and folding of the dough.
3. Over kneading and over proofing of the bread— Over kneading causes excessive heat generation in the dough and in the process the developed gluten is destroyed. Thus, the dough is not able to retain strength to hold its shape during shaping and proofing stages.
4. The dough was hit or accidentally knocked during proofing which leads to escape of CO_2 before and during baking, making the bread flat.

Corrective measures

1. Check the recipe for correct kneading time, proofing time, temperature and condition.

2. Check the gluten development of the dough. To check gluten development in the dough, a small piece of dough is taken to see if it is stretchable and releasable like a rubber band.
3. Breads which require proofing on a set temperature and humidity level are only kept in the proofing chamber. Bread which can be proofed at room temperature, are kept outside of the proofing chamber.
4. Fold and shape the dough correctly as specified.
5. Remake the dough and proof as prescribed.
6. Ensure that the bread dough is not disturbed during proofing period.

Cracks on the bread

This usually happens with breads that are baked in a mould, tin or directly on a baking tray. Sandwich bread, burger bun, hot dog bun, bread rolls, etc., can develop cracks on them.

Causes

1. Under-kneading
2. Under-proofing

Corrective measures

1. Check the recipe for correct time and proofing temperature and condition.
2. Breads which require proofing on a set temperature and humidity level are only kept in the proofing chamber. Bread which can be proofed at room temperature, are kept outside of the proofing chamber.
3. The dough must be always kneaded for the specified time.
4. Remake the dough and proof as prescribed.

Dense and cakey texture in the bread

Dense and cakey texture can occur in any type of bread such as sandwich bread, burger bun, hot dog bun, bread rolls, etc.

Causes

1. The bread was under-proofed.
2. Yeast was not added or the expired yeast was used.
3. Less yeast was used due to which leavening did not happen or it happened only to a certain extent.

Corrective measure

Check the recipe again for correct ingredients, quantity and proofing time, temperature and condition. Remake the dough and proof as prescribed.

Heaviness in the bread

Heaviness can happen with any type of bread such as sandwich bread, burger bun, hot dog bun, bread rolls, etc.

Causes

1. The bread was under-proofed.
2. Yeast was not added or the expired yeast was used.
3. Less yeast was used due to which leavening did not happen or it happened only to a certain extent.

Corrective measure

Check the recipe again for correct ingredients, quantity and proofing time, temperature and condition. Remake the dough and proof as prescribed.

Sunken bread

In this fault, the top or sides of the bread loaf collapses during baking resulting in sunken top or sides of the bread.

Causes

1. The prescribed baking temperature suddenly fell down during baking.
2. The dough was not kneaded for the prescribed time due to which the dough did not develop enough strength to hold its shape.
3. Right amount of yeast was not added to the dough

Corrective measure

1. Check the recipe again for correct ingredients, quantity and remake the dough.

2. Bake at prescribed temperature for prescribed time and keep checking the same from time to time.

Over-rising while baking

This can happen with any type of bread such as sandwich bread, burger bun, hot dog bun, bread rolls, croissant, donuts, etc.

Causes

1. Excessive amount of yeast was used in the dough.
2. Dough was over-proofed.
3. Less or no salt was added during mixing and kneading as per the recipe

Corrective measure

Check the recipe again for correct ingredients, quantity and remake the dough.

Under-rising in the bread while baking

Under-rising in the bread usually happen in sandwich bread, burger bun, hot dog bun, bread rolls, croissant, danish or donut, etc.

Causes

1. The bread was not baked completely.
2. Lower than prescribed temperature was used to bake the bread.
3. The dough was mishandled during proofing i.e. it was hit or knocked accidentally causing escape of trapped CO_2 from the dough.
4. Under-proofed dough kept in the oven for baking.

Corrective measures

1. Check the recipe again for correct ingredients, quantity and remake the dough.
2. Ensure that the bread dough is not disturbed and proofed well during proofing period.

Faults in Pastry and Short Crust Dough

Spreading too much while baking

Spreading happens in short crust pastry such as tarts or cookies product during baking in the oven.

Causes

1. Excess butter was used in the dough.
2. Less flour was used in the dough than specified.

Corrective measure

Check the recipe and correct the amount of ingredients.

Brittleness

Brittleness happens in case of a short crust pastry and laminated pastry products, for example, tarts or cookies and patties or fan.

Causes of brittleness in short crust pastry

1. Excess flour was used.
2. Dough was over-baked at a very low temperature for longer time.

Causes of brittleness in laminated pastry dough

1. Lamination was not done properly i.e. the dough was under-laminated.
2. Pastry was under-baked.

Corrective measures for short crust pastry dough

1. Correct the flour quantity in the short crust pastry.
2. Correct the time and temperature of the pastry dough.

Corrective action for laminated pastry dough

Check the recipe and correct the number of folds in the lamination process.

Shrinking while baking

This is a special condition that occurs in bread dough that are rolled or sheeted with the help of rolling pin or dough sheeter. The dough undergoes a lot of tension while being rolled and because of its elastic nature, it tends to shrink in the oven when the moisture evaporates during baking. This usually happens with flat bread dough such as short crust dough, lavash dough, cracker dough, laminated puff pastry dough, etc.

Cause of shrinking in short crust pastry

Dough was over-kneaded or until it became stretchy.

Causes of shrinking in laminated puff pastry dough

1. The dough after being rolled or sheeted, was not relaxed or rested after rolling.
2. Under-proofed dough kept in the oven for baking.

Corrective measures

1. In case of short crust pastry, use rub-in method to make the dough and avoid over kneading of the dough.
2. In case of laminated pastry dough, after rolling or sheeting the dough, run the palm under the dough 2–3 times by lightly lifting and releasing the dough on the floured surface. This will reduce the tension in the dough. Then cut or shape the dough. And during baking when the moisture evaporates, the size will still remain intact. Check the recipe again for correct instructions to perform the rolling and sheeting process.

Check Your Progress

A. Multiple Choice Questions

1. _____ is used for preparing breads, paav, buns and pizza.
   (a) Flaky pastry dough
   (b) Yeast dough
   (c) Short crust pastry dough
   (d) Puff pastry dough
2. _____ dough is used for biscuits, short crust cookies and pie preparation.
   (a) Flaky pastry
   (b) Yeast
   (c) Puff pastry
   (d) None of the above
3. Butter, sugar and eggs are beaten together and then the flour is folded-in, to form the dough, it is called _____ technique.
   (a) Creaming
   (b) Rubbing-in
   (c) Proofing
   (d) None of the above

4. Butter is incorporated into the flour, then the sugar and eggs are mixed to form the dough in _____ method.
   (a) shortening
   (b) kneading
   (c) leavening
   (d) Rubbing-in
5. Croissants, Danish pastry and Cinnamon roll are prepared using _____.
   (a) Flaky pastry dough
   (b) Yeast dough
   (c) Short crust pastry dough
   (d) Leavened puff pastry dough

B. Mark the statement True or False

1. Bread is raised by the action of yeast.
2. Bread is not highly perishable.
3. Flaky pastry dough is a non-leavened pastry dough.
4. No-time dough process is the longest process of bread making.
5. Knock back is a step in biscuit making.

C. Fill in the blanks

1. In _____ method, all the ingredients are mixed together, and the dough is fermented for a predetermined period.
2. Ferment is an equal proportion of water, _____and tiny quantity of _____ to prepare a thin batter.
3. Lamination is a technique of multiple layering of dough and _____.
4. Gluten development in the _____ dough is undesirable.
5. Yeast acting on the sugar releases carbon dioxide, water and _____.

Answer Key

Unit 1: Overview of the Bakery Sector

Session 1: Baking Process and Categories of Bakery Products

A. Multiple Choice Questions

1. (a)	2. (b)	3. (b)
4. (b)	5. (b)	

B. State True or False

1. True	2. True	3. False
4. True	5. True	

C. Fill in the blanks

1. tandoor
2. Shelf life
3. unleavened
4. Italy
5. French

Session 2: Tools and Equipment used in a Bakery Unit

A. Multiple Choice Questions

1. (b)	2. (c)	3. (a)
4. (a)	5. (a)	

B. State True or False

1. True	2. False	3. False
4. True	5. True	

C. Fill in the blanks

1. paper
2. oven
3. inflammable
4. Electronic
5. whipping

Session 3: Bakery Ingredients

A. Multiple Choice Questions

1. (b)	2. (a)	3. (b)
4. (c)	5. (a)	

B. State True or False

1. True	2. False	3. True
4. True	5. False	

C. Fill in the blanks

1. first
2. bakery
3. Chocolate
4. flavours
5. 50–55

Unit 2: Preparation and Maintenance of Work Area and Machineries

Session 1: Personal Hygiene, Cleanliness and Sanitation

A. Multiple Choice Questions

1. (a) 2. (b) 3. (a)
4. (c) 5. (a)

B. State True or False

1. True 2. False 3. False
4. False 5. False

C. Fill in the blanks

1. chef's coat
2. sharp knives
3. Vinyl gloves
4. Chef cap
5. Chef pants

Session 2: Work Area Preparation

A. Multiple Choice Questions

1. (a) 2. (a) 3. (b)
4. (c) 5. (b)

B. State True or False

1. False 2. True 3. False
4. True 5. False

C. Fill in the blanks

1. dry
2. work flow
3. exhaust
4. zero
5. Food Safety Standards Authority of India

Session 3: Cleaning, Sanitising and Maintaining Work Area, Machines and Tools

A. Multiple Choice Questions

1. (b) 2. (a) 3. (a)
4. (a) 5. (d)

B. State True or False

1. False
2. True
3. False
4. True
5. True

C. Fill in the blanks

1. microorganisms
2. chlorine
3. steam
4. Hydrogen peroxide
5. chemical waste

Unit 3: Food Microbiology

Session 1: Food Spoilage

A. Multiple Choice Questions

1. (a)
2. (d)
3. (a)
4. (b)
5. (b)
6. (c)

B. State True or False

1. True
2. False
3. True
4. True
4. False

C. Fill in the blanks

1. Microorganisms
2. spoiled food
3. causes
4. Amylase
5. 7.5

Session 2: Types of Microorganism

A. Multiple Choice Questions

1. (a)
2. (a)
3. (a)
4. (b)

B. State True or False

1. True
2. True
3. False
4. False
5. False

C. Fill in the blanks

1. Microbes
2. yeast
3. *Lactobacillus*
4. spherical
5. *Aspergillus*

Session 4: Shelf life Evaluation

A. Multiple Choice Questions

1. (a) 2. (a)
3. (a) 4. (d)

B. State True or False

1. True 2. True 3. False
4. True

C. Fill in the blanks

1. 2–3 days
2. preservative
3. antibacterial
4. shelf life

Unit 4: Pre-preparation and Baking Products in the Oven

Session 1: Baker's Math

A. Multiple Choice Questions

1. (a) 2. (a) 3. (a)
4. (a)

B. State True or False

1. True 2. True 3. False
4. True 5. False

C. Fill in the blanks

1. Baker's dozen
2. work plan
3. scaling
4. ratio
5. Simultaneous equation

Session 2: Work Plan of Baking

A. Multiple Choice Questions

1. (a) 2. (c) 3. (b)
4. (a) 5. (a)

B. State True or False

1. True 2. True 3. False
4. False 5. True

C. Fill in the blanks

1. Menu
2. Recipe sheet
3. bread preparation
4. Shortening
5. leavening

Session 3: Types of Dough and their Methods of Preparation

A. Multiple Choice Questions

1. (b) 2. (a) 3. (a)
4. (d) 5. (d)

B. State True or False

1. True 2. False 3. True
4. False 5. False

C. Fill in the blanks

1. Straight dough
2. flour, yeast
3. fat
4. Flaky pastry
5. alcohol

Glossary

Aeration: *incorporation of air or gas, in one or more of the stages of production in bakery products before baking. Air is introduced by the production of carbon dioxide gas (CO_2) from yeast or baking powder.*

***Baati*:** *an Indian origin product made from unleavened dough cooked in Tandoor or Bhatti, commonly eaten in Rajasthan.*

Bagel: *Jewish bread originated in Poland, made from leavened dough in a ring shape, partially boiled first and then baked.*

Baguette: *French originated thin and elongated white bread crispy in nature.*

Baked Potatoes: *potato preparation baked in oven with or without skin.*

Baking powder: *any chemical or mixture of chemicals which, when moistened and heated, generates gas (usually CO_2) which will aerate bread and cakes.*

Baking sheet: *a metal plate on which buns, cakes, pastries and biscuits are baked.*

Batter: *the mixture of flour with moistening liquid in flowing consistency.*

Beating: *the aeration of fat, sugar, eggs and other materials by whisking vigorously together.*

Black Forest Cake: *a version of layered cake made with chocolate sponge and topped with cream icing and chocolate flakes.*

Bread: *a baked product either made from leavened or unleavened dough in oven or hot stone.*

Brioche: *French originated flaky, leavened and enriched bread made in small moulds.*

Brownies: *a baked confectionary product with an enriched batter with chocolate and walnut kernels cut in square shape.*

Bundt: *a type of tube pan with fluted sides.*

Buns: *a type of leavened bread, which may be sliced horizontally to stuff with any edibles.*

Cakes: *a product obtained by baking leavened and shortened batter containing flour, sugar, salt, egg, milk, liquid, flavouring, shortening, and a leavening agent.*

Caramelised Sugar: *dry sugar heated with constant stirring until melted and dark in colour.*

Carrot Cake: *a special cake made from grated carrot in the batter of flour, egg, butter, sugar and baked at 180ºC.*

Chapatti: *an Indian origin bread product made from unleavened dough, griddled on hot iron plates.*

Chiffon Cake: *a very light cake made with flour, eggs, sugar, baking powder, vegetable oil and flavourings.*

Chokha: *a savoury preparation made from oven roasted potato or brinjal.*

Ciabatta: *an Italian originated white bread having flat, broad and elongated shape.*

Cinnamon: *the aromatic bark of certain trees of the laurel family, which is ground and used as spice flavouring.*

Convection: *transfer of heat due to the bulk movement of molecules within fluids (gases and liquids)*

Cookies: *a form of small cake crisply baked from short crust pastry dough*

Crackers: *a type of thin biscuits made from wheat flour or multigrain flour baked till crispy texture.*

Creaming: *the process of mixing and aerating the shortening with sugar and flour.*

Croissants: *a French crescent-shaped roll made of sweet flaky yeast dough, generally eaten in breakfast.*

Crust: *the outermost layer of bread or cake, little brown in colour.*

Crusting: *formation of dry crust on surface which occurs from evaporation of water from the surface.*

Cup-Cake: *a small portion cake made from batter of flour, egg and sugar and baked at 180°C for 35 to 45 minutes.*

Defrost: *free (the interior of a refrigerator or freezer) of accumulated ice, usually by turning it off for a period.*

Dough: *the mixture of mainly flour with moistening liquid in semi solid stage.*

Dough Temperatures: *temperature of dough at different stage of processing.*

Doughnuts: *a ring-shaped deep-fried product, made from leavened dough upto golden colour, may be coated with chocolate or powder sugar.*

Drop Biscuits: *a type of flat and crispy cookies made from the batter of wheat flour, egg and sugar in dropping consistency.*

Dry Yeast: *a dehydrated form of yeast. Dry yeast has a long shelf-life in comparison to fresh yeast, which is perishable.*

Dusting: *spreading a thin film of flour or starch on pans, workbench surfaces or machine surfaces that handle dough pieces.*

Dusting Flour: *flour used to shift on to dough handling equipment to prevent dough from sticking.*

Ergonomically: *a system which minimises physical effort or discomfort and maximises work efficiency*

Fermentation: *the chemical changes in an organic compound due to action of living organisms (yeast or bacteria), usually producing a leavening gas.*

Foam: *mass of beaten egg and sugar as in a sponge cake before the flour is added.*

Folding: *this method is used to gently combine the ingredients allowing air incorporation into the mixture.*

Frostings: *a mixture of sugar, butter, flavouring, water or other liquid, egg whites, etc., for decorating a cake or pastries.*

Gliadin: *one of the two proteins comprising gluten which provides elasticity.*

Glucose: *a simple sugar made by the action of acid or starch.*

Gluten: *the elastic process mass that is formed when the protein material of the wheat flour is mixed with water.*

Glutenin: *one of the two proteins comprising gluten, which gives strength.*

Greasing: *spreading a film of fat on a surface.*

Hygroscopic: *tendency to readily attract water from surroundings*

Invert Sugar: *a mixture of dextrose and levulose made by inverting sucrose with acid or enzymes.*

Kulcha: *Indian origin spongy bread made from self-raised dough in tandoor, sometimes stuffed with savoury preparation.*

Lactose: *the sugar of the milk.*

Lamination: *process of creating many thin layers of dough separated by using butter and produced by repeated folding and rolling.*

Lavash bread: *it is a soft, thin unleavened flatbread traditionally baked in a tandoor.*

Leavening: *raising or lightening by air, steam or gas (carbon dioxide). The agent for generating gas in a dough or batter is usually yeast or baking powder.*

Litti: *Indian origin product made from unleavened dough stuffed with spiced flour of roasted black-gram cooked on coal fire or cow-dung cake.*

Milling: *process of grinding grains and cereals into flour*

Molasses: *light to dark brown syrup obtained in making cane sugar.*

Muffins: *an individual portion self-raised, enriched and baked product served in breakfast.*

Naan: *an Indian origin bread product made from unleavened dough, baked in tandoor.*

***Nankhatai*:** *a traditional Indian cookie made from flour, sugar, curd, baking powder and Ammonium bicarbonate.*

Pastries: *in general, the tiny form of layered cake, cut for individual portion.*

Patties: *in general, the product made from flaky pastry dough and stuffed with savoury preparations.*

Pies: *the short crust pastry product, filled with salty or savoury stuffing, covered with the same pastry sheet and baked.*

Pizza: *a staple bread product from Italian origin, mainly topped with tomato sauce and cheese before being baked.*

Pot wash: *process of cleaning low to heavily baked-on items such as pots, pans, trays, tubs, etc.*

Proof box: *closed box or cabinet in which pans with moulded and made up dough pieces are kept for final stage of fermentation. It should have provisions for controlled temperature and humidity.*

Rancid: *food having an unpleasant smell or taste generally due to the chemical changes or decomposition in its oil content*

Rolling pin: *smooth surfaced wood pieces for rolling dough.*

Savoury: *any enriched salted preparation*

Scones: *a Scottish originated small quick bread using baking powder as leavening agent made of wheat or oatmeal.*

Shelf-life: *period for which a food product is not spoiled and safe for human consumption*

Shortcakes: *a biscuit typically made with flour, sugar, baking powder or soda, salt, butter.*

Shortening agent: *fat or oil used to tenderise the baked goods or to fry products.*

Sifting: *pass through fine mesh for effective blending and to remove foreign or oversize particles.*

SOPs: *a terminology used for Standard Operating Procedure. It is a structured framework of operating procedure for a job.*

Sourdough: *leavened for making bread, consisting of fermenting dough, originally that left over from a previous baking.*

Sponge cake: *a product made from batter of flour, egg and sugar and baked at 180°C for 35 to 45 minutes depending upon volume and size.*

Strong Flour: *one that has good gluten content and suitable for the production of bread of good volume and quality.*

Tart: *small pastries with heavy fruit filling or cream.*

Toque: *a chef cap used to cover the head by the bakery worker*

Tortilla: *Mexican origin staple bread made from unleavened dough of maize and wheat flour baked in oven.*

***vol-au-vent*:** *a vol-au-vent is a small hollow case of puff pastry originated in France.*

Wash (in context of baking): *a liquid such as water, milk, starch solution or thin syrup of egg is brushed on the surface of an unbaked product to give the product a shiny and golden brown surface.*

Whip: *a hand or mechanical beater of wire construction used to whip materials such as cream or egg whites to a frothy consistency.*

Yeast: *a microscopic plant that reproduces by building and causes fermentation and the giving off carbon dioxide.*

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