उ० प्र० राजर्षि टण्डन
मुक्त विश्वविद्यालय, प्रयागराज

HNSEC-06

Bakery And Quantity Cookery

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An Overview of Bakery Industry 8

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Preparation and Quality Evaluation of Bread and its Products 35

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UTTAR PRADESH RAJARSHI TANDON OPEN UNIVERSITY
HNSEC-06 BAKERY AND QUANTITY COOKERY

PROF.SATYAKAM **VICE CHANCELLOR**

COURSE DESIGN COMMITTEE

Prof. Meera Pal, **Director In charge**
School of Health Sciences, UPRTOU, Prayagraj.UP.

Prof. Neelam Yadav **Member**
Centre of Food Technology, University of Allahabad, UP

Dr. Pinki Saini, **Member**
Associate Professor
Centre of Food Technology, University of Allahabad, UP

Dr. Alka Gupta, **Member**
Associate Professor, Department of Food and Nutrition,
SHUATS, Naini, Prayagraj. UP

Dr. Zoomi Singh, **Member**
Assistant Professor,(C)
Food and Nutrition, UPRTOU, Prayagraj. UP

COURSE PREPRATION COMMITTEE

Dr. Arun Kumar Pandey **Block-1,2** **Writer**
Associate Professor
Department of Zoology
PSM PG College, Anand Nagar,Maharajganj(UP).

Dr.Rajeev Ranjan **Block-1,2** **Editor**
Associate Professor
Deapartment of Botany, MLKPG College, Balrampur (UP).

Prof. Meera Pal **Course Coordinator**
Director,
Department of Food, Nutrition and Dietetics,
UPRTOU,Prayagraj.UP

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COURSE INTRODUCTION

The objective of this course is to provide basic introduction about concepts and different theories of communication in nutrition processes. Nutrition education is the process of informing people about nutrition information, while nutrition communication is the process of only when factors external to communication interventions are conducive to their achievement.The course is organized into following two blocks as under:

Block: 1

It covers the overview of Bakery Industry, Preparation and Quality Evaluation of Bread and its Products

Block: 2

It deals about preparation and quality evaluation of Biscuits, Cookies Macroons, Muffins Home Made Choclates and Pies

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Block-1

An Overview of Bakery Industry, Preparation and Quality Evaluation of Bread and its Products

Unit 1:
An Overview of Bakery Industry **8**

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Block Introduction

This is the first block (An Overview of Bakery Industry, Preparation and Quality Evaluation of Bread and its Products) of Bakery and QuantityCookery**.** It consists of three units as under:

Unit 1: An Overview of Bakery Industry

Unit 2: Preparation and Quality Evaluation of Bread and its Products

Unit 3: Preparation and Quality Evaluation of Bread, Bun, Pastries Cakes, Cake Decoration and Modified Bakery Products

The introduction of first block is as under:

Bakery industry in India has witnessed remarkable growth in recent years, owing to changing consumer preferences, urbanization, and increasing disposable incomes. From traditional local bakeries to modern pastry shops, India's bakery sector has transformed into a dynamic and lucrative market. It has become a lucrative market for both established players and new entrants. The Indian bakery market size reached USD 11.3 billion in 2022. According to a report published by IMARC Group, the Bakery Industry in India is expected to reach USD 21.2 billion by 2028, exhibiting a growth rate (CAGR) of 10.8% during 2023-2028. The Indian bakery market has witnessed robust growth in recent years, and its market share continues to expand.

The bakery industry in India offers a wide array of products, ranging from bread, cakes, pastries, cookies, biscuits, and snacks. The demand for these products is driven by the country's large population, changing lifestyles, urbanization, and the growing trend of convenience foods. The bakery industry caters to both retail customers and the thriving foodservice sector, including hotels, restaurants, cafes, and quick-service restaurants (QSRs). With the rising demand for quality bakery products, there is immense potential for growth and diversification within the sector.

The bakery industry in India is poised for substantial growth in the coming years, driven by changing consumer preferences, rising disposable incomes, and growing urbanization, changing lifestyles and technological advancements. Despite challenges such as competition, ingredient sourcing, and infrastructure requirements, the industry offers significant opportunities for established players and aspiring entrepreneurs. By leveraging innovation, catering to evolving consumer demands, and

maintaining product quality, companies can unlock the tremendous potential that the Indian bakery market holds.

Bread is a staple food prepared from a dough of flour (usually wheat) and water, usually by baking. Throughout recorded history and around the world, it has been an important part of many cultures' diets. It is one of the oldest human-made foods, having been of significance since the dawn of agriculture, and plays an essential role in both religious rituals and secular culture.Bread may be leavened by naturally occurring microbes (e.g. sourdough), chemicals (e.g. baking soda), industrially produced yeast, or high-pressure aeration, which creates the gas bubbles that fluff up bread. In many countries, commercial bread often contains additives to improve flavor, texture, color, shelf life, nutrition, and ease of production.

Cake is a flour confection usually made from flour, sugar, and other ingredients and is usually baked. In their oldest forms, cakes were modifications of bread, but cakes now cover a wide range of preparations that can be simple or elaborate and which share features with desserts such as pastries, meringues, custards, and pies.The most common ingredients include flour, sugar, eggs, fat (such as butter, oil, or margarine), a liquid, and a leavening agent, such as baking soda or baking powder. Common additional ingredients include dried, candied, or fresh fruit, nuts, cocoa, and extracts such as vanilla, with numerous substitutions for the primary ingredients. Cakes can also be filled with fruit preserves, nuts, or dessert sauces (like custard, jelly, cooked fruit, whipped cream, or syrups), iced with buttercream or other icings, and decorated with marzipan, piped borders, or candied fruit.

Cake is often served as a celebratory dish on ceremonial occasions, such as weddings, anniversaries, and birthdays. There are countless cake recipes; some are bread-like, some are rich and elaborate, and many are centuries old. Cake making is no longer a complicated procedure; while at one time considerable labor went into cake making (particularly the whisking of egg foams), baking equipment and directions have been simplified so that even the most amateur of cooks may bake a cake.

Unit- 1: An Overview of Bakery Industry

Structure

Objectives

1.1 Introduction

1.2 Bakery industry & its economic importance in India

1.2.1 Economic Sustainability:

1.2.2 Environmental Sustainability:

1.2.3 Social Sustainability:

1.3 Classification of Baked foods

1.3.1 What is Baking?

1.4 Nutritional Quality and Safety of Products/Foods

1.4.1 Importance of Food Safety and Quality

1.5 Packaging Material, Method, and Storage

1.5.1 Chemical Protection

1.5.2 Biological Protection

1.5.3 Physical Protection

1.5.4 Packaging Categories

1.5.5 Materials and Design Used in Food Packaging

1.7 What are Ingredients?

1.7.1 The Importance of Ingredients

1.7.2 Taste and Texture: Enhancing the Consumer Experience

1.7.3 Effectiveness and Performance: Delivering Desired Results

1.8 Food Standards and Regulation in India

1.8.1 Food Safety and Standards Act, 2006

1.9 Food Safety and Standards Regulations, 2011

1.10 Mixing and Gluten Development

1.11 Summary

1.12 Terminal questions

Further readings

1.1 Introduction

A bakery is an establishment that produces and sells flour-based baked goods made in an oven such as bread, cookies, cakes, doughnuts, bagels, pastries, and pies. Some retail bakeries are also categorized as cafés, serving coffee and tea to customers who wish to consume the baked goods on the premises. In some countries, a distinction is made between bakeries, which primarily sell breads, and patisseries, which primarily sell sweet baked goods. Baked goods have been around for thousands of years. The art of baking was very popular during the Roman Empire. It was highly famous art as Roman citizens loved baked goods and demanded them frequently for important occasions such as feasts and weddings. Because of the fame of the art of baking, around 300 BC, baking was introduced as an occupation and respectable profession for Romans. Bakers began to prepare bread at home in an oven, using grist mills to grind grain into flour for their breads. The demand for baked goods persisted, and the first bakers' guild was established in 168 BC in Rome. The desire for baked goods promoted baking throughout Europe and expanded into eastern parts of Asia. Bakers started baking bread and other goods at home and selling them on the streets.

This trend became common, and soon, baked products were sold in streets of Rome, Germany, London, and more. A system of delivering baked goods to households arose as the demand increased significantly. This prompted bakers to establish places where people could purchase baked goods. The first open-air market for baked goods was established in Paris, and since then bakeries have become a common place to purchase delicious goods and to socialize.

On July 7, 1928, a bakery in Chillicothe, Missouri introduced sliced bread using the automatic bread-slicing machine, invented by Otto Frederick Rohwedder. While the bread initially failed to sell, due to its sloppy aesthetic, and the fact it went stale faster, it later became popular. In World War II bread slicing machines were effectively banned, as the metal in them was required for wartime use. When they were requisitioned, creating 100 tons of metal alloy, the decision proved very unpopular with housewives.

World War II directly affected the bread industry in the UK. Baking schools closed during this time, so when the war ended there was a lack of skilled bakers. This resulted in new methods being developed to satisfy the world's desire for bread, including chemical additives, premixes and specialised machinery. Old methods of baking were almost completely eradicated when these new methods were introduced and the industry became industrialised. The old methods were seen as unnecessary and financially unsound. During this period there were not many traditional bakeries left.

Objectives

This is the first unit (An Overview of Bakery Industry) of first block (An Overview of Bakery Industry, Preparation and Quality Evaluation of Bread and its Products). After studying this unit, you will be able to:

- To introduce bakery industry & its economic importance
- To discuss about baked foods and its classification
- To describe nutritional quality and safety of products/Foods
- To know about materials and design used in food packaging

Some bakeries provide services for special occasions (such as weddings, anniversaries, birthday parties, business networking events, etc.) or customized baked products for people who have allergies or sensitivities to certain foods (such as nuts, peanuts, dairy or gluten, etc.). Bakeries can provide a wide range of cake designs such as sheet cakes, layer cakes, wedding cakes, tiered cakes, etc. Other bakeries may specialize in traditional or hand-made types of baked products made with locally milled flour, without flour bleaching agents or flour treatment agents, baking what is sometimes referred to as artisan bread.

In many countries, many grocery stores and supermarkets sell sliced bread (prepackaged/presliced bread), cakes, and other pastries. They may also offer in-store baking, with products either fully baked on site or part-baked prior to delivery to store, and some offer cake decoration. Nonetheless, many people still prefer to get their baked goods from a small artisanal bakery, either out of tradition, the availability of a greater variety of baked products, or due to the higher quality products characteristic of the trade of baking.

1.2 Bakery industry & its economic importance in India

The bakery industry in India is growing rapidly with the rise in demand for bakery products such as bread, cakes, biscuits, and pastries. The industry is contributing significantly to the Indian economy, and it has the potential for further growth. However, there are challenges that need to be addressed to ensure the sustainable development of the bakery industry in India. Sustainability is defined as the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. In the context of the bakery industry, sustainability means balancing economic, environmental, and social aspects to ensure long-term growth.

1.2.1 Economic Sustainability:

The bakery industry in India is a major employer and contributes significantly to the economy. However, to ensure economic sustainability, the industry needs to focus on cost-effective production processes and product innovation to remain competitive in the global market. One way to achieve cost-effectiveness is by using renewable energy sources such as solar energy to power bakery operations. This not only reduces energy costs but also reduces greenhouse gas emissions, contributing to environmental sustainability. Moreover, using locally sourced ingredients and supporting local farmers can help create a sustainable supply chain. Innovation is also crucial for economic sustainability. The bakery industry in India needs to invest in research and development to create new products that cater to changing consumer preferences. For example, there is a growing demand for healthy bakery products that are low in sugar, fat, and calories. The industry needs to respond to this demand by creating innovative products that meet these requirements.

1.2.2 Environmental Sustainability:

The bakery industry in India needs to adopt eco-friendly practices to reduce its environmental impact. One of the major environmental issues associated with the bakery industry is waste generation. The industry can reduce waste by using ingredients efficiently, avoiding overproduction, and donating unsold products to food banks. Another way to promote environmental sustainability is by using eco-friendly packaging materials such as paper, biodegradable plastics, and reusable containers. The industry can also reduce its carbon footprint by sourcing ingredients locally and avoiding unnecessary transportation.

1.2.3 Social Sustainability:

The bakery industry in India is labor-intensive and employs a large number of people. To ensure social sustainability, the industry needs to ensure fair wages, safe working conditions, and opportunities for skill development and career advancement for its workers. Moreover, the bakery industry can contribute to social sustainability by supporting the local community. For example, the industry can partner with local schools and community organizations to provide training and employment opportunities for underprivileged youth.

1.3 Classification of Baked foods

Baking is a big deal in India. It's not just about making yummy treats; it's a part of our culture and traditions. During festivals like Diwali, Eid, and Christmas, we make special baked sweets and snacks. These goodies aren't just food, they're symbols of happiness and togetherness. Whether it's a rich cake, crispy cookies, or spicy bread, these baked treats bring people closer and make celebrations extra

special.Baking isn't just for festivals; it's a part of our daily lives too. It's a way of sharing love and joy with family and friends, making every moment a little sweeter.

Baking in India has undergone a remarkable transformation in recent years, evolving from a niche hobby to a widespread culinary phenomenon. This shift reflects not only changing tastes and lifestyles but also the growing influence of global culinary trends and the increasing availability of baking equipment and ingredients. The popularity of baking shows and cooking channels has fuelled a newfound enthusiasm for baking among Indian audiences. This accessibility has empowered home bakers to explore new baking techniques, flavours, and decorating styles, elevating their baking skills to new heights.

1.3.1 What is Baking?

Baking is a cooking method that uses dry heat to transform raw ingredients into delicious, cooked food. Typically done in an oven, baking involves exposing food to controlled temperatures for a specific duration, allowing ingredients like flour, eggs, and leavening agents to interact and create textures, flavours, and structures unique to baked goods.From bread and cakes to cookies and pastries, baking encompasses a wide range of sweet and savoury treats enjoyed by people worldwide. Now, let’s look at simple and easy baking methods.

1. Creaming Method

The creaming method involves beating together butter and sugar until light and fluffy, incorporating air into the mixture, which helps in achieving a tender and moist baked good. Eggs are then added gradually, followed by dry ingredients, resulting in a smooth batter ideal for cakes, cookies, and muffins.

2. Mix it, All Together

This method, also known as the one-bowl or dump-and-stir method, simplifies baking by combining all ingredients in a single bowl and mixing until just combined. It's quick and easy, making it perfect for busy bakers or novice cooks, but may require extra care to avoid overmixing, which can lead to tough textures in baked goods.

3. Melt, Mix & Bake

Ideal for recipes like brownies and certain cakes, this method involves melting fats like butter or chocolate, then mixing them with other ingredients before baking. It results in dense, fudgy textures and intense flavours, perfect for indulgent treats.

4. Whisking Method

The whisking method relies on whipping eggs and sugar together until thick and pale, creating a light and airy base for delicate desserts like soufflés, mousse, and genoise sponge cakes. Gentle folding of dry ingredients maintains the airy texture while adding structure to the final product.

5. Rubbing in Method

Mainly used for pastry dough and crumbly textures, the rubbing-in method involves rubbing cold fat into dry ingredients, such as flour and sugar, until the mixture resembles breadcrumbs. This technique creates a flaky, tender pastry crust or streusel topping, perfect for pies, tarts, and crumbles.

Common Types of Baked Goods

1. Breads and Flatbreads

Includes staples like roti, naan, paratha, puri, and kulcha, which are made from dough and cooked through baking or griddling.

2. Sweets and Desserts

Encompasses a wide range of treats, including cakes, cookies, pastries, and traditional Indian sweets like gulab jamun, jalebi, and barfi, which are baked to perfection and often enjoyed during celebrations and festive occasions.

3. Savoury Snacks

Consists of savoury baked goods like samosas, kachoris, mathris, and bread pakoras, which are filled with flavourful fillings and enjoyed as snacks or appetizers.

4. Breakfast Items

Includes baked breakfast items such as muffins, croissants, bagels, and pancakes, which are enjoyed with spreads, jams, or as accompaniments to morning meals.

5. Cakes and Pastries

Comprises a variety of cakes, including sponge cakes, pound cakes, and layer cakes, as well as pastries like puffs, tarts, and eclairs, which are adorned with different types of frosting, fillings, and decorations for special occasions or everyday indulgence.Stepping into the world of baking can be exciting, let’s explore some baking tips to elevate your baking experience.

1. Preheat your oven properly to ensure even baking and consistent results.
2. Use quality ingredients and measure accurately to maintain the balance of flavours and textures in your baked goods.

3. Rotate your pans halfway through baking to ensure even browning and prevent hot spots in the oven.
4. Allow baked goods to cool completely on a wire rack before serving or storing to avoid trapping excess moisture and maintain freshness.

Mastering different baking methods opens up a world of possibilities in the kitchen, allowing you to create an array of delicious treats from simple cookies to elaborate cakes. Understanding these techniques empowers you to experiment with flavours, textures, and presentations, elevating your baking game and delighting your taste buds. So, whether you're a seasoned baker or just starting out, have fun exploring these methods and discovering your signature bakes.

1.4 Nutritional Quality and Safety of Products/Foods

Food safety is a scientific discipline or a set of routines undertaken to ensure consumers' safety and prevent food-related harms, hazards, or risks along the entire food supply chain. Recently, food safety issues have come into the limelight. According to the Food and Agriculture Organization of the United Nations, there would be approximately 0.6 billion cases of foodborne illnesses annually if food safety issues are not efficiently tackled. Collectively, food safety issues would incur socioeconomic burdens to the consumers (e.g. health risks, hospitalisation bills, and death) and the food industries (e.g. product recalls, food waste, and loss of yields) alike. In terms of food security, food safety constitutes the third pillar of food security which is the utilisation of safe, quality, and nutritious foods.

Nowadays, consumer awareness and demand on consuming safe and quality food products have intensified. However, despite the growing awareness, the safeness of food products is still of concern as the risk of contamination can still occur from farm to fork. Many countries, such as the United States, European Union, Australia, and China have promulgated food safety regulations and policies to minimise the risk of foodborne illnesses since public health can primarily be achieved through food safety practices and implementation. For example, the United States Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA) are pivotal regulatory agencies in charge of assuring food safety in the United States. Food Safety Modernization Act (FSMA) was enforced by the FDA with the goal of preventing foodborne illnesses.

The degree of food products' safety and quality are closely related to the metabolites formed and present in the final products which in turn are affected by the different food processing techniques. Therefore, the determination of the metabolites in food products has been garnering attention concerning its generation, modes of action, and effects on human health. Besides metabolites, food

products might also be contaminated by external toxic substances/toxicants which could also lead to health hazards.

The scientific study of chemical processes involving metabolites is called metabolomics. Recently, metabolomics has successfully found its way into various fields such as agriculture, biology, biomedical, and nutrition with the discovery of bioactive compounds, nutritional and functional genomics, disease diagnosis/disease prognosis, biomarker discovery and identification, drug discovery and exploitation, toxicity evaluation, and many others. In food, various metabolomics approaches have been applied such as in food traceability, food safety, and food quality investigations.

Among the various threats and concerns in food safety and food quality is food adulteration (also known as food fraud) which is a global issue. Generally, food adulteration is the process in which the food quality is lowered either by extraction, removal, or substitution of valuable food constituents, or by the addition of low-quality material for economic gain, and it is a deceptive practice of misleading consumers. Food adulteration has become a "profitable market" nowadays by selling inferior quality food products at higher prices to consumers. In certain cases, food adulteration could pose a threat to human health.

For instance, in Malaysia in 1988, an outbreak of food poisoning resulting in 13 deaths was caused by the use of banned food preservative (boric acid) and aflatoxin-contaminated raw materials in the preparation of Chinese noodles; the "2008 Chinese milk scandal" saw the food safety officials seizing 64 tonnes of raw dairy materials contaminated with the toxic industrial chemical melamine (2,4,6-triamino-1,3,5-triazine; banned nitrogen-rich compound, and was used to increase the nitrogen content in diluted milk to pass the quality control test of milk protein content) which affected 294,000, hospitalised 54,000, and killed 50 babies; and in Greece in 2013, chicken nuggets were adulterated with horse meat with the same source highlighting that adulterated foods kill 3000 people each year and sicken 48 million in the USA alone. Therefore, it is imperative to scrutinise and verify the quality of food to assure the consumers' safety against these fraudulent activities.

The replacement of food ingredients (e.g. modifying the food products' formulation by limiting the usage of fat or substituting sugar with honey) or the addition of additives (e.g. either natural or synthetic additives that have antioxidant properties) could also influence the formation of metabolites and toxicants in the food matrices. Examples of natural antioxidants are flavonoids, ascorbic acid, tocopherols, and carotenoids, while examples of synthetic antioxidants are butylated

hydroxyanisole (BHA), butylated hydroxytoluene (BHT), tertiary butylhydroquinone (TBHQ), and propyl gallate (PG). To date, however, conclusive scientific data linking their relationships are scarce.

Metabolomics data could be important in managing food risks, developing food safety policies, and determining the chemical, nutritional, and sensorial changes in final food products. This review manuscript reports the applications of metabolomics in food analyses and recent advancements in integrating metabolomics technologies with other analytical approaches. Additionally, the manuscript explores in detail the current profiling and identification of metabolites in foods. Several recently published articles highlight advancements in the technologies and applications of metabolomics in food science and technology.

1.4.1 Importance of Food Safety and Quality

Currently, food safety and quality have drawn increasing attention. The principles and practices of food safety and quality are applied to foods from all raw materials (i.e., farm produce, ingredients, and packaging materials) to final products. The basic need for food safety and quality activities are influenced by several factors, such as consumer expectations relating to various aspects of food (e.g., nutrition and additives), incidents relating to food safety (e.g., safe and legal additives, contaminants, and toxicants), environmental concerns (e.g., packaging material), changes in government regulatory processes (e.g., food law and food regulation amendment), traceability in food production and processing (e.g., coding system), technological changes (e.g., food processing method), foods derived from biotechnology (e.g., GMO-free certificate).

The terms food safety and food quality are frequently used interchangeably; however, differences exist between the two concepts. Food safety refers to the extent to which those requirements relating specifically to properties or characteristics that have the potential to be detrimental to health or cause illnesses are met; while food quality refers to the extent to which all the established requirements pertaining to the characteristics of a food are met. A food that does not meet the food safety requirements is automatically not meeting the food quality requirements. Contrarily, a food can meet the food safety requirements, but not meet the other quality requirements. For example, the high-heat processing method eliminates all microbes in food, but it may produce a poor-quality product.

Since food safety has become a part of food quality characteristics, the food placed on the market has met these two characteristics for consumers. Food safety practices and principles are always integrated into food quality assurance or quality management systems. For instance, the HACCP system is integrated within the quality systems. HACCP system is used to support the production of safe food by

managing food safety risks and hazards throughout the production chain. Most importantly, the food and feed industries have developed comprehensive quality management systems in the past years to restructure the food inspection system and improve food safety.

1.5Packaging Material, Method, and Storage

Packaging Systems Used in the Food Industry

- The main goal of food processing is to increase the shelf life and palatability of foods, make them safe and enjoyable to consume.
- This is accomplished using physical, chemical and microbiological transformation of raw materials into finished goods.
- One of the most important steps in food processing is packaging. Food packaging will protect food products from outside influences and damage. Food packaging can be grouped into chemical, physical, and microbiological protection.

1.5.1 Chemical Protection

- Minimizes compositional changes triggered by environmental influences such as exposure to gases (typically oxygen), moisture (gain or loss), or light (visible, infrared, or ultraviolet).
- Many different packaging materials can provide a chemical barrier.
- Glass and metals provide a nearly absolute barrier to chemical and other environmental agents, but few packages are purely glass or metal since closure devices are added to facilitate both filling and emptying.
- Closure devices may contain materials that allow minimal levels of permeability.
- Plastic packaging offers a large range of barrier properties; however, it is generally more permeable than glass or metal.

1.5.2 Biological Protection

- Provides a barrier to microorganisms (pathogens and spoiling agents), insects, rodents, and other animals, thereby preventing disease and spoilage.
- In addition, biological barriers maintain conditions to control senescence (ripening and aging).
- Such barriers function by preventing access to the product, preventing odor transmission, and maintaining the internal environment of the package.

1.5.3 Physical Protection

- Shields food from mechanical damage and includes cushioning against the shock and vibration encountered during distribution.

- Typically developed from paperboard and corrugated materials, physical barriers resist impacts, abrasions, and crushing damage, so they are widely used as shipping containers and as packaging for delicate foods such as eggs and fresh fruits.
- Appropriate physical packaging also protects consumers from hazards. For example, child-resistant closures hinder access to potentially dangerous products.
- In addition, the substitution of plastic packaging from products ranging from shampoo to soda bottles has reduced the danger from broken glass containers.
- Slow Deterioration: Food packaging can slow product deterioration, retain the beneficial effects of processing, extend shelf-life, and maintain or increase the quality and safety of food.
- Contain the Food: The goal of food packaging is to contain food in a cost-effective way that satisfies industry requirements, consumer desires, maintains food safety, and minimizes environmental impact.

1.5.4 Packaging Categories

Each level of packaging applied is categorized based on contact with the product:

- Primary Packaging – Direct Contact with the Consumer Good (e.g. food)
- Secondary Packaging – Surrounds the Primary Packaging
- Tertiary (Transit) Packaging – Surrounds the Secondary Packaging

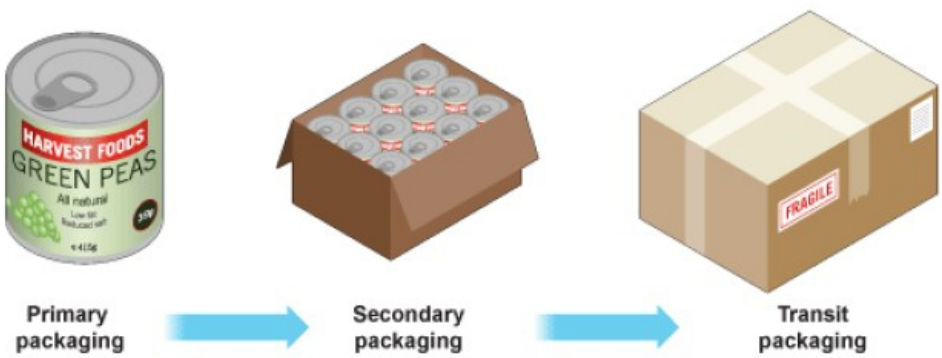

Fig.1: Packaging Categories

1.5.5 Materials and Design Used in Food Packaging

- Package design and construction play significant role in determining the shelf life of a food product.
- The right selection of packaging materials and technologies maintains product quality and freshness during distribution and storage.

- Materials that have traditionally been used in food packaging include glass, metals (aluminum, foils and laminates, tinplate, and tin-free steel), paper and paperboards, and plastics.
- A wider variety of plastics have been introduced in both rigid and flexible forms.
- Today's food packages often combine several materials to exploit each material's functional or aesthetic properties.
- As research to improve food continues, advances in the field may affect the environmental impact of packaging.

Glass

- Glass has an extremely long history in food packaging.
- Glass containers used in food packaging are often surface-coated to provide lubrication in the production line and eliminate scratching or surface abrasion and line jams.
- Because it is odorless and chemically inert with virtually all food products, glass has several advantages for food-packaging applications.
- It is impermeable to gases and vapors, so it maintains product freshness for a long period without impairing taste or flavor.
- The ability to withstand high processing temperatures makes glass useful for heat sterilization of both low-acid and high-acid foods.
- Glass is rigid, provides good insulation, and can be produced in numerous different shapes; it is also reusable and recyclable.

Disadvantages:

- Despite efforts to use thinner glass, its heavy weight adds to transportation costs.
- Another concern is brittleness and susceptibility to breakage from internal pressure, impact, or thermal shock.
- Food safety hazard of broken glass

Metal

- Metal is the most versatile of all packaging forms.
- It offers a combination of excellent physical protection and barrier properties, formability and decorative potential, recyclability, and consumer acceptance.
- The two metals that are most predominately used in packaging are Aluminum and Steel.

Laminates and Metallized Films

- Lamination of packaging involves the binding of aluminum foil to paper or plastic film to improve barrier properties.

- Thin gauges facilitate application.
- Lamination to plastic enables heat sealing ability but the seal does not completely bar moisture and air.
- Laminated aluminum is relatively expensive and it is typically used to package high value foods such as dried soups, herbs, and spices.
- A less expensive alternative to laminated packaging is metallized film.
- Metallized films are plastics containing a thin layer of aluminum metal
- These films have improved barrier properties to moisture, oils, air, and odours, and the highly reflective surface of the aluminum is attractive to consumers.
- Metallized films are more flexible than laminated films and are mainly used to package snacks.[h5p id=”25″]

Advantages to Using Plastics

- Because they are fluid and easy to form, plastics can be made into sheets, shapes, and structures, offering considerable design flexibility.
- Plastics can be chemically resistant, inexpensive and lightweight with a wide range of physical and optical properties.
- Many plastics are heat sealable, easy to print, and can be integrated into production processes where the package is formed, filled, and sealed in the same production line.

Types of Plastics

- Multiple types of plastics are being used as materials for packaging food.
- They include polyethylene (HDPE & LDPE), polyolefin, polyester, polyvinyl chloride, polyvinylidene chloride, polystyrene, polyamide, and ethylene vinyl alcohol.
- Of more than 30 types of plastics used as packaging materials; polyolefins and polyesters are most common.

Paper and Paperboard

- The use of paper and paperboards for food packaging dates back to the 17th century with accelerated usage in the later part of the 19th century.
- Paper and paperboard are sheet materials made from an interlaced network of cellulose fibers derived from wood by using sulfate and sulfite.
- The fibers are then pulped and/or bleached, treated with chemicals and strengthening agents to produce the paper product.
- The additives used in paper and paperboard food packaging are regulated in both the US and Canada.

- Paper and paperboards are commonly used in corrugated boxes, milk cartons, folding cartons, bags and sacks, and wrapping paper.
- Tissue paper, paper plates, and cups are other examples or paper and paperboard products.

Food/Package Interaction

- Plays an important role in the proper selection of packaging materials for various food applications.
- Each packaging material has different inherent properties.
- These properties affect the selection of which material is best for a particular food, given the characteristics of that food.
- Food/package interaction involves the transportation of low molecular weight compounds such as gases or vapours and water from:
    - The food through the package
    - The environment through the package
    - The food into the package
    - The package into the food

Modified Atmosphere Packaging (MAP)

- Modified atmosphere is the practice of modifying the composition of the internal atmosphere of a package in order to improve the shelf life of the product.
- The modification process most often used is to lower the amount of oxygen (O^2), reducing it from 20.9% to 0%, in order to:
    - Slow down the growth of aerobic microorganisms
    - Slow the speed of oxidation reactions

- **Types of MAP Packaging**
    - Gas Flushing
    - Barrier Packaging Films
    - Scavenger or Desiccant Packs
    - On-Package Valves

Gas Flushing

Gas flushing displaces the ambient oxygen with a harmless gas before the package is sealed. The removed oxygen can be replaced with:

- Nitrogen (N_2), commonly known as an inert gas
- Carbon dioxide (CO_2), which can lower the pH or inhibit the growth of bacteria
- Carbon monoxide (CO), used for keeping the red colour of meat

The injected gas can also act as a filler to maintain conformity.

Barrier Packaging Films

Barrier packaging films are an example of passive modified atmosphere packaging. Select packaging films act as barrier packaging by providing decreased permeability to moisture and oxygen. Examples include:

- LDPE: low-density polyethylene
- PVC: polyvinylchloride
- PP: polypropylene

Scavenger or Desiccant Packs

Scavenger or desiccant packs are added inside of packaging with the consumer good to absorb ambient moisture and/or oxygen from the interior of the package. These packs are often found in pharmaceutical containers (pill bottles) or within clothing and footwear items prone to the effects of moisture.

On-Package Valves

One-way valves are added to the exterior of packaging. The valves allow certain gases to escape without allowing any gases into the package.Products that may release gases after packaging, such as coffee, can benefit from the addition of an on-package valve to release pressure. In addition, the valves can also be used to allow air to escape packages and help with packing and palletization.

Microwave Packaging

- Metallized films are used as a susceptor for cooking in microwave ovens. These increase the heating capacity and help make foods crisp and brown.
- Susceptors: Microwave susceptors are used to provide additional thermal heating on the outside of food articles that are heated in a Microwave Oven.
- Typically, aluminum metallized polyester (PET) sheets, whereas the aluminum is deposited with very low thickness

1.6 Basic Principles of Baking

*"Baking can often be referred to as the chemistry of cooking. All ingredients must be accurately measured, and measurement is critical."*Baking is an altogether new world that incorporates an entire set of new principles, techniques, and strategies and figuring out how to bake can take numerous years. In the culinary business, it is so wide that it is generally done as a specialization. To help you out with the basic principles of baking, we have categorized the complete process of baking below.

Fig.2: Baking Process

1. Ingredients

If you were to substitute carrots for turnips in a stew, would you observe an extreme change in the flavour? Not so much. The impact would be almost none. With regards to baked desserts, changing an ingredient produces an enormous impact on the dessert and can on a very basic level change the dessert. There are various flours, fluids, fats, and sugars that all work in a different way. Even the temperature of all the ingredients should be perfect for a perfect dessert. Bread flour and cake flour are not the same, nor are butter and shortening. Substitute one element for another, and the outcome will be totally unique. So, choosing the accurate ingredients according to the recipe you are following is very important.

2. Different Types of Flours

There is a wide variety of flours that can be used in the process of baking. Wheat flour is the most well-known flour that is utilized in baking. It is available in a wide range. Wheat flour is the main flour that can easily generate gluten. Gluten is the tough, rubbery substance made when wheat flour is blended in with water. It gives structure, appearance, and contain gases in the dough. In the case that there was no gluten, you would not have raised bread.Many flours, when combined, produce all-purpose flour which you generally buy in supermarkets. It is around ⅓ soft and ⅔ hard flour and is broadly utilized in home baking. It can be easily used in many cake recipes, but professional bakers avoid this flour.

3. Leavening Agents

A leavening agent plays an important role in the procedure or recipe that generates air, offering an ascend to a heated dessert. When you look at bread closely, you'll notice the number of air pores contained inside it. The air pores are made by leavening agents and are fundamental in providing light and fluffy desserts. A proper selection of the leavening agent is very necessary, and a bad choice can ruin the taste and structure of the desserts.

4. Mixing Methods

There are numerous mixing strategies that are utilized to deliver various doughs and batters. Knowing these mixing techniques is very important, and most of the cake recipes assume that you know these techniques and differences between each one of them. The basic mixing methods that you should know are blending, beating, cutting, creaming, folding, stirring, kneading, sifting, and whipping. So, according to the mixing method mentioned in the cake recipe you follow, do it properly for a perfect cake.

5. Heating

Preheating the oven is as significant as extending the legs before a run, or heating up the vehicle before starting, or letting the water get hot before you go for a shower. Preheating is important to give an underlying push of warmth. Numerous dough and batters which are made utilizing leavening agents like yeast, baking powder or baking soda require a decent push of warmth toward the start for the ideal ascent, texture, and browning. That’s why it is instructed to preheat the oven while you prepare the batter.So, these are some of the very basic principles of baking. Of course, there is a large list of guideline and principles in baking, and you can go for it if you are trying to get a degree or speciality in the same. For your basic home baking, the above-mentioned principles will do the work for you! If you are not much interested in baking, you can always buy cakes online like jar cakes, cupcakes, designer cakes, etc.

1.7What are Ingredients?

Ingredients are the fundamental components or substances used in the preparation of food, beverages, cosmetics, pharmaceuticals, and various other products. They form the building blocks of a recipe or formulation and contribute to the taste, texture, appearance, and overall quality of the final product. Ingredients are the components used in cooking or manufacturing products. They form the foundation of recipes, dishes, and various goods. Ingredients can include foods, spices, liquids, and additives. Their combination and proportions determine the final outcome's taste, texture, and quality. Choosing quality ingredients is vital for successful outcomes.

In the context of cooking, ingredients can include a wide range of items such as fruits, vegetables, meats, grains, dairy products, spices, herbs, oils, and sweeteners. Each ingredient brings its unique flavor profile, nutritional value, and functional properties to the dish. The combination and proportion of ingredients determine the taste and character of the culinary creation.In the field of cosmetics and pharmaceuticals, ingredients comprise substances like botanical extracts, essential oils, vitamins, minerals, emulsifiers, preservatives, and fragrance compounds. These ingredients serve specific purposes, such as moisturizing the skin, providing therapeutic effects, improving product stability, or enhancing the sensory experience.

The selection and quality of ingredients play a crucial role in the success of a recipe or product. It is essential to choose fresh, high-quality ingredients to ensure the desired taste, texture, and efficacy. Additionally, proper storage and handling of ingredients are important to maintain their freshness and prevent spoilage.Understanding the properties and interactions of ingredients is vital for chefs, formulators, and manufacturers to create innovative and appealing products. They carefully measure and combine ingredients to achieve the desired balance of flavors, textures, and nutritional profiles. Whether in the culinary world or other industries, ingredients are the key elements that contribute to the creation of delightful and functional products that satisfy our senses and meet our needs.

1.7.1 The Importance of Ingredients

In various industries and domains, the importance of ingredients cannot be overstated. Whether it's the culinary world, skincare and beauty, healthcare, or technology, ingredients play a crucial role in determining the taste, texture, effectiveness, and safety of the final product. Choosing the right ingredients can make a significant difference in the quality and success of a recipe or product. Additionally, ingredients have a broader impact beyond product attributes, including factors such as sustainability, ethical sourcing, and environmental impact, making them vital considerations in today's conscientious consumer market.

1.7.2 Taste and Texture: Enhancing the Consumer Experience

Ingredients are the key to creating flavors and textures that captivate our taste buds. In the culinary world, the selection and combination of ingredients are essential for achieving the desired taste profiles of dishes. From aromatic herbs and spices to savory proteins and fresh produce, each ingredient contributes to the overall flavor experience. Furthermore, ingredients can influence the texture of food, determining whether it's smooth, crispy, chewy, or creamy. The careful balance and harmonization of ingredients allow chefs to create memorable dining experiences.

1.7.3 Effectiveness and Performance: Delivering Desired Results

In skincare and beauty products, the choice of ingredients is critical for delivering the desired results. Ingredients with specific properties can address various skin concerns, such as moisturization, brightening, anti-aging, or acne-fighting. For example, hyaluronic acid provides hydration, retinol helps with collagen production, and antioxidants protect against environmental damage. The effectiveness of these products relies heavily on the selection and concentration of active ingredients.

Similarly, in healthcare, ingredients form the basis of medicines and supplements. Active pharmaceutical ingredients (APIs) are carefully selected for their therapeutic properties and ability to treat specific ailments. Other ingredients in formulations assist in absorption, stability, controlled release, and taste masking, ensuring that medicines perform optimally and deliver the intended benefits.

Safety and Consumer Well-being: Meeting Regulatory Standards

Safety is of utmost importance when selecting ingredients for products consumed or applied to the body. Regulatory agencies establish guidelines and standards to ensure that ingredients are safe for human use. Rigorous testing and evaluation are conducted to assess potential risks and adverse effects. By adhering to these standards, manufacturers prioritize consumer well-being and ensure that their products meet safety requirements.

Sustainability and Ethical Sourcing: Making Responsible Choices

Ingredients have a significant impact on sustainability and ethical considerations. Increasingly, consumers are conscious of the environmental footprint and ethical implications of their purchases. Ingredients sourced through sustainable practices, such as responsible farming, fair trade, and biodiversity conservation, contribute to reducing environmental harm and supporting ethical supply chains. By opting for sustainably sourced ingredients, businesses can meet consumer expectations and contribute to a greener, more responsible future.

Environmental Impact: Mitigating Ecological Consequences

The selection of ingredients can influence the environmental impact of products. By choosing ingredients that are responsibly sourced, environmentally friendly, and biodegradable, businesses can reduce their ecological footprint. For example, opting for plant-based ingredients instead of those derived from animal sources can help mitigate deforestation, greenhouse gas emissions, and animal

welfare concerns. Additionally, reducing the use of harmful chemicals and embracing eco-friendly alternatives can further minimize the environmental impact of ingredients.

The importance of ingredients cannot be overstated in various industries and domains. They impact the taste, texture, effectiveness, and safety of products, making them crucial for delivering desirable outcomes. Moreover, ingredients play a role in sustainability, ethical sourcing, and environmental impact, aligning with the values and expectations of conscientious consumers. By carefully selecting ingredients, businesses can create high-quality products that not only meet consumer demands but also contribute to a better and more sustainable future.

1.8Food Standards and Regulation in India

Food Safety and Standards Authority of India (FSSAI) is an autonomous body established under the Ministry of Health & Family Welfare, Government of India, responsible for protecting and promoting public health through the regulation and supervision of food safety. FSSAI of India has laid down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import, to ensure availability of safe and wholesome food for human consumption. FSSAI has been established under the Food Safety and Standards Act, 2006 which is a consolidating statute related to food safety and regulations in India. This Act replaced all the other food laws existed in the system including Prevention of Food Adulteration (PFA) ACT, 1954 , Food Product Order, (FPO), The Vegetable Oil Product Order, 1998 etc. This is an integrated Food Law and has created unified framework for food regulations which has shifted primary responsibility of safety to food businesses and hence assuring food safety across the food chain and ensuring uniform application of standards and practices across the country. Thus, One Nation One Food Law.

The main goal of FSSAI is to:

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

This nationwide approach is being adopted in India to ensure better transparency, consistency and predictability of food business environment. We shall now learn about the FSS act, being formulated after merging the old food laws.

1.8.1 Food Safety and Standards Act, 2006

The Food Safety and Standards Act received the assent of the President on 23rd August, 2006 and came into effect on 5th August, 2011. The Act officially repeals the regulatory framework established by the previously existing eight food laws by Notification F.No.P15025/41/2011-DFQC, issued by the

Ministry of Health and Family Welfare on August 4, 2011, consolidating them into the Food Safety and Standards Rules and Regulations 2011 under a single regulator **The Food Safety and Standards Authority of India**

On May 5, 2011, the GOI Ministry of Health and Family Welfare published the final Food Safety and Standards Rules, 2011 vide Notification No.G.S.R.362 (E) in the Indian official gazette. On August 1, 2011, the Ministry of Health and Family Welfare published the final Food Safety and Standards Regulations, 2011 vide Notification No. F.No. 2- 15015/30/2010 in the Indian official gazette.The implementation of the Food Safety and Standards Act, 2006 formally repeals the following laws:

- The Prevention of Food Adulteration Act (PFA), 1954,
- The Fruit Products Order, 1955,
- The Meat Food Products Order, 1973,
- The Vegetable Oil Products (Regulation) Order, 1998,
- The Edible Oils Packaging (Regulation) Order 1988,
- The Solvent Extracted Oil, De-Oiled Meal and Edible Flour (Control) Order, 1967,
- Milk and Milk Products Order, 1992,
- Any other order issued under the Essential Commodities Act, 1955 relating to food. The Act puts in place a unified structure for all food safety related matters in the form of FSSAI at the Centre ad Commissioners of Food Safety at the State level and covers activities throughout the food distribution chain, from primary production through distribution to retail and catering.

Under this, law is significant in ensuring quality food to the consumer. It protects consumer interest by prohibiting misleading advertisement and penalising adulteration. Additionally there are laws to address contemporary challenges facing the sector like provisions related to Genetically Modified (GM) crops, functional food, international trade in food items etc. The following are the statutory powers that the FSS Act, 2006 gives to the Food Safety and Standards Authority of India (FSSAI). Framing of regulations to lay down food safety standards Laying down guidelines for accreditation of laboratories for food testing Providing scientific advice and technical support to the Central Government Contributing to the development of international technical standards in food Collecting and collating data regarding food consumption, contamination, emerging risks etc. Disseminating information and promoting awareness about food safety and nutrition in India.

In a nutshell, the Act takes care of international practices and envisages an overreaching policy framework and provision of single window to guide and regulate persons engaged in manufacture,

marketing, processing, handling, transportation, import and sale of food. Hence, the Act is applicable to anyone who handles, processes, manufactures, sells, serves, stores, distributes, transports or imports food. With an above discussion, now you must be aware of the Indian food safety governing body which intends to ensure better consumer safety through Food Safety Management Systems and setting standards.

1.9Food Safety and Standards Regulations, 2011

The Food Safety and Standards Regulations, 2011, came into force on August 5, 2011. These regulations contain labelling requirements and standards for packaged food, permitted food additives, colours, microbiological requirements, etc. In all they deal with the enforcement structure of the Food Safety and Standards Authority and the procedures to be followed by the authorities. There are total of 17 regulations laid by the FSSAI for enforcement of food safety standards in India. Let us discuss some of these regulations in brief.

(A) Food Safety and Standards (Packaging) Regulation, 2018

The Regulations provide a detailed list of packaging materials that may be used for the packaging of specific categories of food products and also prescribe specific requirements/ restrictions in their regard.

(B) Food Safety and Standards (Fortification of Foods) Regulations, 2018

As per this regulation, every manufacturer and packer of fortified food shall give an undertaking on quality assurance and submit evidence of steps taken in this regard to the Food Authority or such other authority which the Food Authority may designate. Further all fortified food, whether voluntarily fortified or required to undergo mandatory fortification shall be manufactured, packed, labeled, handled, distributed and sold, only in compliance with the standards specified under the provisions of the Act and regulations made. And such products shall be packaged in a manner that takes into consideration the nature of the fortificant added, for example: Every package of food, fortified with Iron shall carry a statement “People with Thalassemia may take under medical supervision”.

(C) Food Safety and Standards (Organic Food) Regulation, 2017

Under this regulation, the organic food offered or promoted for sale shall also comply with all the applicable provisions of one of the following systems, namely:—

(i) National Programme for Organic Production (NPOP);

(ii) Participatory Guarantee System for India (PGS-India).

(iii) Any other system or standards as may be notified by the Food Authority from time to time.

D) Food Safety and Standards (Food Product Standards and Food Additives) Regulation, 2011

No article of food should contain any food additive or processing aid except in accordance with the Regulations.

E) Food Safety and Standards (Recognition and Notification of Laboratories) Regulation, 2018.

The Food Authority may recognise any notified food laboratory or referral food laboratory as reference laboratory for the purpose of developing methods of testing, validation, proficiency testing and training.

F) Food Safety and Standards (Import) Regulation, 2017

A number of products are being imported into India from the various countries. As per the mandate fro providing safe and wholesome food to public FSSAI made its presence at various ports to check and clearance of safe food.

1.10Mixing and Gluten Development

Gluten is a protein found in wheat products. In bread making, it's exceedingly important. Think of gluten as the miraculous net that holds bread together; it helps dough rise by trapping gas bubbles during fermentation and gives bread its unique texture. Although bread begins with many of the same ingredients as cookies, pastries, cakes, and even shortbreads, it has a completely different consistency. Gluten makes bread airy and satisfyingly chewy. it's hard to imagine enjoying a chewy cake or a bread that crumbles like a cookie.

Gluten is formed when two of wheat's native proteins, glutenin and gliadin, come into contact with water. That's why it's more accurate to talk about the gluten potential of a particular flour, rather than its gluten content. Either way you phrase it, the more gluten a flour can produce, the more able the dough is to hold gas bubbles, and those gas bubbles are what gives bread an open crumb. From a baker's perspective, gluten development begins during mixing. The basic point of mixing is to hydrate flour. Mixing matters not because it is necessary to develop gluten, you can develop gluten with minimal mixing. Mixing is essential because it speeds up the hydration process and ensures that water is evenly dispersed throughout the flour. When the glutenin and gliadin proteins are hydrated,they almost immediately bind and form gluten. The longer glutenin pieces link up with each other via disulfide bonds to form strong, stretchy units of molecules. These interlinked strands are among the largest protein molecules yet identified. More compact gliadin proteins allow the dough to flow like a fluid, whereas glutenins contribute strength.

Gluten is a substance made up of primarily two proteins present in wheat flour. It gives the product its structure and resilience. Gluten is developed by first absorbing water. Then, as the dough or batter is

mixed, kneaded, or folded, the gluten forms long, spring-like elastic strands. If the dough or batter is leavened, the strands capture gases in tiny pockets or cells, and we say it begins to rise. However it is also resilient and tries to shrink back and retain its shape. By allowing the dough to bench rest before make-up (shaping), the gluten has a chance to relax making it easier to manage.

There are several factors and ingredients that help in controlling gluten development. Flour is one of them. Flour is mostly starch and knowing the protein content determines what kind of flour to use when making breads, cakes, or pastries. Strong flours come from hard wheat and have high protein content. Weak flours come from soft wheat and have lower protein content. Flour grown in the United States has a higher protein content than flours grown in Europe. There are six main categories of wheat grown in North America. They are listed in order of highest to lowest protein content:

- **Durum:**basically used for pastas
- **Hard Red Spring:** used in breads that require strong bread flours
- **Hard White:** high-protein wheat grown in smaller quantities
- **Hard Red Winter:** moderate strength wheat grown in large quantities
- **Soft White:** low-protein wheat used in making cakes, pastries, and crackers
- **Soft Red Winter:** low-protein wheat used in making cake and pastry flours

Shortening is anther factor in gluten development. Solid fats or oils affect the gluten by shortening the strands. Shortening acts as a tenderizer. When a fat is introduced into a formula, the fat bonds with parts of the gluten protein and stops it from forming strong gluten strands. When fat is introduced the dough becomes more flaky and crumbly. Mixing, kneading, and folding also affect the outcome of a final product. Pie dough is an example of this. It can either be “flaky” or “mealy” depending on how long the dough is worked. The less it is worked, the more tender and flaky it is. In essence, the longer dough is mixed, kneaded, or folded, the more gluten it develops. Bread dough is mixed for long times, while pie crusts, cookies and other similar products are mixed for shorter periods of time.

Finally, liquids also have an affect on gluten development. Because gluten proteins must absorb water to develop, the amount of water in a formula directly relates to the toughness or tenderness of a specific product. Formulas with less water produce crispier and flakier products. When the gluten network is strong enough, the dough can be shaped. Bakers check gluten development by performing the windowpane test, which involves stretching a portion of dough in your hands. A well-developed dough can be stretched so thin that it’s translucent. Gluten strands tighten and reorganize once again as

the dough is divided and shaped. The tension created during shaping helps the dough expand at a steady rate, producing uniform loaves.

Fig. 3. Gluten Development

Most of the carbon dioxide production during fermentation happens in the final proofing stage. The largest volume increase comes during baking when the dough nearly doubles in volume in the oven. To expand during both processes, the dough must be strong enough to retain the gas that's produced. Gluten makes the dough elastic enough that the bubble walls can expand like a little balloon without tearing up until the point where the bread over-proof's. When carbon dioxide exerts more pressure than a proofed dough can withstand, the gluten structure weakens, releasing the gas and deflating the over-proofed dough.

1.11 Summary

Under this unit we have summarized the concepts of bakery industry, its economic importance in India, environmental sustainability, cllassification of baked foods, packaging materials, method, and storage etc. The bakery industry in India has the potential for sustainable development, but it requires a holistic approach that balances economic, environmental, and social aspects. By adopting eco-friendly practices, promoting innovation, and supporting the local community, the industry can contribute to the overall sustainability of the Indian economy. According to the U.N. Environment Programme,

environmental sustainability involves making life choices that ensure an equal, if not better, way of life for future generations.

Environmental sustainability aims to improve the quality of human life without putting unnecessary strain on the earth's supporting ecosystems. It's about creating an equilibrium between consumerist human culture and the living world. We can do this by living in a way that doesn't waste or unnecessarily deplete natural resources. Food Safety can be defined as the ways and methods that are adopted to ensure that food is fit to be eaten. It aims at avoiding, minimising, and controlling risks that are biological, chemical and physical in nature and can cause illnesses or injuries associated with foods. Food hygiene and safety procedures should be practised from the time a particular food item is procured to the time it is ready to be consumed, and it is imperative that this is put into practice.

It is therefore significantly more than an exercise of avoiding the obvious dangers. This concept is marked by a preventive outlook that continually looks for lurking risks and seeks to eliminate them at every point in the food chain, often by conducting a thorough food safety risk assessment. This encompasses the food sector and especially the growers, horticulturists as well as the agricultural and food chain agents, including processors, transporters, handlers, retailers and preparers of food.

1.12 Terminal questions

Q. 1 What do you mean by bakery industry? Describe its economic importance in India.

Answer:----------

Q. 2 Describe the classification of baked foods.

Answer:----------

Q. 3 Describe the importance of food safety and quality.

Answer:----------

Q. 4 Write short notes on the following.

(a) Packaging materials

(b) Nutritional quality

Answer:----------

Q. 5 Write a short notes on environmental sustainability.

Answer:----------

Q. 6 What are the ingredients? Describe its economic.

Answer:----------

Q. 7 Describe role of medicine and medical science.

Answer:----------

Further readings

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

Unit- 2: Development of Gluten, Methods, Ingredients and Additives, Bakery unit and Organizational Structure

Structure

Objectives

2.1 Introduction

2.2 Gluten

2.3 Additives

2.3.1 Use of Additives Bakery Products

2.3.2 Flavor Boosters and Enhancers

2.3.3 Flavor Potentiators

2.4 Salt

2.5 Food product for humans

2.6 Melting Point of a Fat

2.6.1 Physical properties of oils and fats

2.6.2 Crystallization of Fats

2.6.3 Non-dietary uses

2.7 Leavening

2.7.1 Chemical Leaveners

2.7.2 List of Chemical Leavening Agents

2.8 killer of yeast

2.9 Toxins

2.9.1Killing of microorganisms

2.10 Immunity

2.11 Bread, Preparation & Formulation

2.12 Flour

2.13 Yeast

2.14 Summary

2.15 Terminal questions

Further readings

2.1 Introduction

Gluten seems to be in just about everything, from bread, pasta and beer to cosmetics and nutritional supplements. There's lots of buzz around avoiding gluten, but what is this common ingredient and is it really bad for you? Johns Hopkins specialist in internal medicine, explains facts and misconceptions about gluten. Gluten is a protein found in the wheat plant and some other grains. Gluten is naturally occurring, but it can be extracted, concentrated and added to food and other products to add protein, texture and flavor. It also works as a binding agent to hold processed foods together and give them shape. In addition to wheat, gluten also comes from rye, barley and triticale (a cross between rye and barley). Sometimes it's in oats, but only because the oats may have been processed with other foods that contain gluten. Oats themselves don't contain gluten.

Humans have digestive enzymes that help us break down food. Protease is the enzyme that helps our body process proteins, but it can't completely break down gluten. Undigested gluten makes its way to the small intestine. Most people can handle the undigested gluten with no problems. But in some people, gluten can trigger a severe autoimmune response or other unpleasant symptoms. An autoimmune response to gluten is called celiac disease. Celiac can damage the small intestine. Some people who don't have celiac disease still seem to feel sick after eating foods that contain gluten. They may experience bloating, diarrhea, headaches or skin rashes. This could be a reaction to poorly digested carbohydrates, not just gluten. These carbs, called FODMAPS, ferment in your gut. People with sensitive guts may experience discomfort from that fermentation, not necessarily from gluten.

Research suggests that some people could have small intestines that don't work properly. The lining might be too permeable, allowing some undigested gluten, bacteria or other substances to go through the lining and into the bloodstream, causing inflammation. There's a lot of confusion about gluten being an evil food. Gluten isn't inherently bad for most people. We, as humans, have consumed gluten for as long as people have been making bread. For centuries, foods with gluten have been providing people with protein, soluble fiber and nutrients."

Gluten in itself, especially gluten found in whole grains, is not bad for healthy people whose bodies can tolerate it. However, grains like wheat are often stripped down to make processed foods such as snack crackers and potato chips. These refined products have very little resemblance to the actual wheat plant, which is actually highly nutritious, explains Rajagopal. They tend to contain things like white rice flour and starches, but not whole grains. Many people who adopt a gluten-free diet but still

eat processed foods find they continue to have weight gain, blood sugar swings and other health issues. So it's not the gluten in foods that's causing their health issues, but the sodium, sugar and other additives in processed foods.

Objectives

This is the second unit **(**Development of Gluten, Methods, Ingredients and Additives, Bakery unit and Organizational Structure**)** of first block **(**An Overview of Bakery Industry, Preparation and Quality Evaluation of Bread and its Products). After studying this unit, you will be able to:

- To discuss about gluten, additives and bakery products
- To know about flavor boosters, enhancers, and chemical leaveners
- To discuss different uses of additives bakery products
- To discuss about toxins, bread preparation & formulation

2.2 Gluten

Gluten is a structural protein naturally found in certain cereal grains. The term *gluten* usually refers to the elastic network of a wheat grain's proteins, gliadin and glutenin primarily, that forms readily with the addition of water and often kneading in the case of bread dough. The types of grains that contain gluten include all species of wheat (common wheat, durum, spelt, khorasan, emmer and einkorn), and barley, rye, and some cultivars of oat; moreover, cross hybrids of any of these cereal grains also contain gluten, e.g. triticale.Gluten makes up 75–85% of the total protein in bread wheat.Glutens, especially Triticeae glutens, have unique viscoelastic and adhesive properties, which give dough its elasticity, helping it rise and keep its shape and often leaving the final product with a chewy texture. These properties, and its relatively low cost, make gluten valuable to both food and non-food industries.

Fig. 1: Wheat, a prime source of gluten

Wheat gluten is composed of mainly two types of proteins: the glutenins and the gliadins, which in turn can be divided into high molecular and low molecular glutenins and α/β, γ and Ω gliadins. Its homologous seed storage proteins, in barley, are referred to as hordeins, in rye, secalins, and in oats, avenins. These protein classes are collectively referred to as "gluten". The storage proteins in other grains, such as maize (zeins) and rice (rice protein), are sometimes called gluten, but they do not cause harmful effects in people with celiac disease.Gluten can trigger adverse, inflammatory, immunological, and autoimmune reactions in some people. The spectrum of gluten related disorders includes celiac disease in 1–2% of the general population, non-celiac gluten sensitivity in 0.5–13% of the general population, as well as dermatitis herpetiformis, gluten ataxia and other neurological disorders. These disorders are treated by a gluten-free diet.

Uses

Bread products

Gluten forms when glutenin molecules cross-link via disulfide bonds to form a submicroscopic network attached to gliadin, which contributes viscosity (thickness) and extensibility to the mix. If this dough is leavened with yeast, fermentation produces carbon dioxide bubbles, which, trapped by the gluten network, cause the dough to rise. Baking coagulates the gluten, which, along with starch, stabilizes the shape of the final product. Gluten content has been implicated as a factor in the staling of bread, possibly because it binds water through hydration.

Fig. 2: Cross-section of a baguette showing a strong gluten network

The formation of gluten affects the texture of the baked goods. Gluten's attainable elasticity is proportional to its content of glutenins with low molecular weights, as this portion contains the preponderance of the sulfur atoms responsible for the cross-linking in the gluten network. Using flour with higher gluten content leads to chewier doughs such as those found in pizza and bagels, while using flour with less gluten content yields tender baked goods such as pastry products.

Fig. 3: Bread produced from wheat grains contains gluten.

Generally, bread flours are high in gluten (hard wheat); pastry flours have a lower gluten content. Kneading promotes the formation of gluten strands and cross-links, creating baked products that are chewier (as opposed to more brittle or crumbly). The "chewiness" increases as the dough is kneaded for longer times. An increased moisture content in the dough enhances gluten development, and very wet doughs left to rise for a long time require no kneading. Shortening inhibits formation of cross-links and is used, along with diminished water and less kneading, when a tender and flaky product, such as a pie crust, is desired. The strength and elasticity of gluten in flour is

measured in the baking industry using a farinograph. This gives the baker a measurement of quality for different varieties of flours when developing recipes for various baked goods.

2.3 Additives

Additives are substances added to food products to enhance their flavor, texture, appearance, or shelf life. The use of additives in bakery products is a common practice in the food industry, as they can help to improve the quality and safety of these products. Flavor is a complicated and sometimes conflicting thing, but bitter blockers, flavor maskers and potentiators can help deliver the optimum flavor attributes desired. One of the most common types of additives used in bakery products is emulsifiers. These substances help to mix oil and water-based ingredients together, which improves the texture and stability of the final product. Examples of emulsifiers used in bakery products include lecithin, monoglycerides, and diglycerides.

Another type of additive used in bakery products is preservatives. These substances help to prolong the shelf life of the products by preventing the growth of bacteria, mold, and other microorganisms. Common preservatives used in bakery products include sodium propionate, calcium propionate, and potassium sorbate. Bakery products also commonly use enzymes, which aid in the fermentation process and improve the texture of the final product. Examples of enzymes used in bakery products include amylases, proteases, and lipases. A final example of an additive used in bakery products is artificial sweeteners. These substances are used to sweeten products without adding calories. Examples of artificial sweeteners used in bakery products include saccharin, aspartame, and sucralose.

It is important to note that the use of additives in food products, including bakery products, is regulated by the Food and Drug Administration (FDA) in the United States. The FDA sets limits on the amount of each additive that can be used in a product and also sets guidelines for the labeling of products that contain additives. Use of additives in bakery products is a common practice in the food industry, as they can help to improve the quality and safety of these products. Additives such as emulsifiers, preservatives, enzymes, and artificial sweeteners are commonly used in bakery products to enhance flavor, texture, appearance, and shelf life.

It is important to keep in mind, however, that not all additives are safe for consumption. Some additives have been linked to health concerns, such as cancer and allergic reactions. Therefore, it is important to be aware of the types of additives used in bakery products, and to consume them in moderation. Additionally, some individuals may have dietary restrictions that prohibit the consumption of certain types of additives. For example, individuals with celiac disease or gluten sensitivities may

need to avoid bakery products that contain gluten, a protein found in wheat, barley, and rye. Similarly, individuals with dairy allergies may need to avoid bakery products that contain milk or butter.

One way to avoid consuming unwanted additives is to purchase bakery products from local, independent bakeries. These bakeries often use fewer additives than large commercial bakeries, and may also use higher quality ingredients. Additionally, some bakeries may offer a selection of all-natural or organic products that are free from artificial preservatives, colors, and flavors. While additives can be beneficial in enhancing the quality and safety of bakery products, it's important to be aware of the types of additives used and to consume them in moderation. Individuals with dietary restrictions or health concerns may want to consider purchasing bakery products from local, independent bakeries or making their own bakery products at home.

Another important aspect to consider when discussing the use of additives in bakery products is the impact on the environment. Many of the synthetic additives used in the food industry are derived from fossil fuels and contribute to the depletion of non-renewable resources. Furthermore, the production and disposal of these additives can also contribute to pollution and damage to the environment. To address these concerns, some bakery products manufacturers have started to use natural and organic additives, which are derived from renewable sources and are less harmful to the environment. Additionally, some companies have started to use sustainable packaging materials, such as biodegradable or compostable packaging, to reduce their environmental footprint.Consumers can also make a difference by choosing to purchase bakery products that are made with natural and organic ingredients, and are packaged in sustainable materials. This can help to support companies that are making an effort to reduce their environmental impact and can also help to promote the use of more sustainable ingredients and packaging materials in the food industry.

The use of additives in bakery products can have a significant impact on both human health and the environment. While additives can be beneficial in enhancing the quality and safety of bakery products, it is important to be aware of the types of additives used and to consume them in moderation. Consumers can make a difference by choosing to purchase bakery products that are made with natural and organic ingredients, and are packaged in sustainable materials.Another aspect that is often overlooked when discussing the use of additives in bakery products is the impact on small and local businesses. Many small and independent bakeries rely on traditional methods and natural ingredients, rather than using a large number of additives to enhance their products. These businesses often struggle to compete with larger commercial bakeries that use more additives and can produce goods at a lower cost.

2.3.1 Use of Additives Bakery Products

Additives are substances added to food products to enhance their taste, texture, appearance, or preservation. They are commonly used in the bakery industry to improve the quality and shelf life of bread, cakes, pastries, and other baked goods.One of the most commonly used additives in bakery products is yeast. Yeast is a microorganism that ferments the sugars in dough, causing it to rise and become light and fluffy. It also imparts a characteristic flavor and aroma to bread. Yeast is a natural additive that has been used for thousands of years in bread-making.

Another important additive in bakery products is emulsifiers. Emulsifiers are substances that help to blend and stabilize ingredients that would otherwise separate, such as oil and water. They are commonly used in cakes, pastries, and other baked goods to improve the texture and prolong the shelf life of the product. Some common emulsifiers used in the bakery industry include lecithin, mono- and diglycerides, and polyglycerol esters.

Preservatives are also commonly used in bakery products to extend their shelf life. These additives help to prevent the growth of mold and bacteria, which can cause spoilage and food poisoning. Some common preservatives used in bakery products include sodium propionate, potassium sorbate, and calcium propionate.Food colorings and flavorings are also often used in bakery products to enhance their appearance and taste. These additives can be natural or artificial, and can range from simple vanilla extract to complex chemical compounds.While additives can improve the quality and shelf life of bakery products, they can also have potential health concerns. Some additives have been linked to allergic reactions, and others have been found to be carcinogenic or otherwise harmful. It is important to check the ingredients list on bakery products and be aware of any potential health concerns.

2.3.2 Flavor Boosters and Enhancers

In the world of clean-label development, adding to the conundrum for developers is the need for products or methods to be low-cost, seamless on the processing floor and look good on a label, falling within the clean-label vernacular. As a result, desirable flavor attributes like sweetness, richness and more subtle under- or overtones can be lost during manufacturing. In addition, using ingredients such as caffeine, vitamins, meat analogs, dairy replacements and other on-trend ingredients like CBD can leave behind undesirable flavors and off-notes for the product developer to eliminate or reduce. Enter the world of clean-label bitter blockers, flavor maskers, flavor potentiators and flavor extenders, all designed to help the processor dial in the exact flavor attributes desired.

Boosting flavor is rarely straightforward. It usually involves elevating some flavor notes while blocking others. Flavor enhancers, potentiators and extenders typically function in tandem with a

specific flavor. At the same time, maskers and blockers are used against the flavor of the near-finished product. The ingredient chosen to mask or enhance may only act as a neutral ingredient that binds to or counteracts specific flavor components. The ingredient used might carry its weight in the formulation and elevate the overall flavor.

2.3.3 Flavor Potentiators

Flavor potentiators are designed to elevate flavor and mouthfeel. In the savory category, glutamic acid is king. Glutamic acid occurs naturally in foods such as tomatoes, cheese, mushrooms, seaweed, yeast extracts and fermented foods. Extracts, powders and concentrates of all of these products can be used to boost umami and kokumi notes and reduce sodium. Boasting 10-30% less sodium than traditionally brewed soy sauces, Kikkoman's line of Natural Flavor Enhancers (made from naturally fermented soy) adds glutamic-rich umami notes while keeping your label clean. Possessing a mild aroma and a balanced, brothy flavor, the NFE line comes in liquid and powder forms and a powder enriched with yeast extract for an even more potent umami punch.

Speaking of sodium reduction, there are several options to reduce sodium without compromising flavor. One popular approach is to use a salt that provides a bigger salt kick than NaCl salt. Another method might be to use sodium chloride in a slightly different form. A smaller crystal, for instance, would have more contact points with taste receptors than a bigger crystal, creating a salty flavor with less salt in the formula. Moving to sugar reduction, high-intensity sweeteners such as monk fruit and stevia carry bitter or oddly cooling finishing notes when used at high levels. Masking products derived from licorice, vanilla and citrus can hide bitter notes by contributing pleasing notes to the overall flavor profile.

Adding other sweet ingredients is another approach to boost sweetness. For instance, fruit concentrates add sweetness without adding sugar. As a masking agent in seed formulations, vanilla is a powerful tool. It is especially good at blocking the bitterness of chocolate and covering up the beany notes of plant-based nutrition bars and meal replacement beverages. The spices we associate with the holidays, such as nutmeg, cinnamon, cardamom, and clove, can also boost sweetness without added sugar.

2.4 Salt

In common usage, salt is a mineral composed primarily of sodium chloride (NaCl). When used in food, especially in granulated form, it is more formally called table salt. In the form of a natural crystalline mineral, salt is also known as rock salt or halite. Salt is essential for life in general, and saltiness is one of the basic human tastes. Salt is one of the oldest and most ubiquitous

food seasonings, and is known to uniformly improve the taste perception of food, including otherwise unpalatable food. Salting, brining, and pickling are also ancient and important methods of food preservation.

Sodium is an essential element for human health via its role as an electrolyte and osmotic solute. However, excessive salt consumption may increase the risk of cardiovascular diseases, such as hypertension, in children and adults. Such health effects of salt have long been studied. Accordingly, numerous world health associations and experts in developed countries recommend reducing consumption of popular salty foods. The World Health Organization recommends that adults consume less than 2,000 mg of sodium, equivalent to 5 grams of salt, per day.

There is more salt in animal tissues, such as meat, blood, and milk, than in plant tissues. Nomads who subsist on their flocks and herds do not eat salt with their food, but agriculturalists, feeding mainly on cereals and vegetable matter, need to supplement their diet with salt. With the spread of civilization, salt became one of the world's main trading commodities. It was of high value to the ancient Hebrews, the Greeks, the Romans, the Byzantines, the Hittites and other peoples of antiquity. In the Middle East, salt was used to ceremonially seal an agreement, and the ancient Hebrews made a "covenant of salt" with God and sprinkled salt on their offerings to show their trust in him. An ancient practice in time of war was salting the earth: scattering salt around in a defeated city to prevent plant growth.

Physical properties

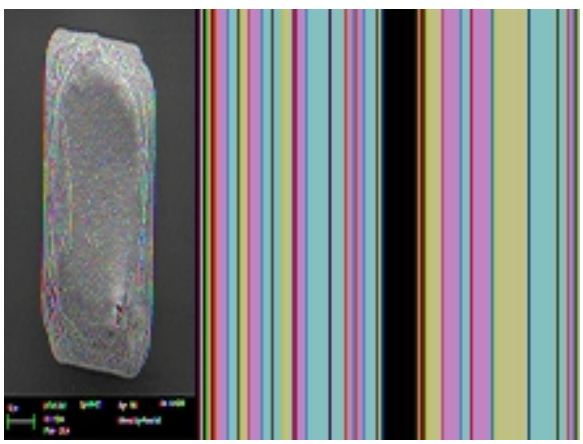

Fig. 4:SEM image of a grain of table salt

Salt is mostly sodium chloride (NaCl). Sea salt and mined salt may contain trace elements. Mined salt is often refined. Salt crystals are translucent and cubic in shape; they normally appear white but impurities may give them a blue or purple tinge.

Edible salt

Comparison of table salt with kitchen salt. Shows a typical salt shaker and salt bowl with salt spread before each on a black background.Salt is essential to the health of humans and other animals, and it is one of the five basic taste sensations. Salt is used in many cuisines, and it is often found in salt shakers on diners' eating tables for their personal use on food. Salt is also an ingredient in many manufactured foodstuffs. Table salt is a refined salt containing about 97 to99 percent sodium chloride. Usually, anticaking agents such as sodium aluminosilicate or magnesium carbonate are added to make it free-flowing. Iodized salt, containing potassium iodide, is widely available. Some people put a desiccant, such as a few grains of uncooked rice or a saltine cracker, in their salt shakers to absorb extra moisture and help break up salt clumps that may otherwise form.

Fortified table salt

Some table salt sold for consumption contains additives that address a variety of health concerns, especially in the developing world. The identities and amounts of additives vary from country to country. Iodine is an important micronutrient for humans, and a deficiency of the element can cause lowered production of thyroxine (hypothyroidism) and enlargement of the thyroid gland (endemic goitre) in adults or cretinism in children. Iodized salt has been used to correct these conditions since 1924 and consists of table salt mixed with a minute amount of potassium iodide, sodium iodide, or sodium iodate. A small amount of dextrose may also be added to stabilize the iodine. Iodine deficiency affects about two billion people around the world and is the leading preventable cause of intellectual disabilities. Iodized table salt has significantly reduced disorders of iodine deficiency in countries where it is used.

Salt in food

Salt is present in most foods, but in naturally occurring foodstuffs such as meats, vegetables and fruit, it is present in very small quantities. It is often added to processed foods (such as canned foods and especially salted foods, pickled foods, and snack foods or other convenience foods), where it functions as both a preservative and a flavouring. Dairy salt is used in the preparation of butter and cheese products. As a flavouring, salt enhances the taste of other foods by suppressing the bitterness of those foods making them more palatable and relatively sweeter.

Biology of salt taste

Human salt taste is detected by sodium taste receptors present in taste bud cells on the tongue. Human sensory taste testing studies have shown that proteolyzed forms of epithelial sodium channel (ENaC) function as the human salt taste receptor.

Sodium consumption and health

Table salt is made up of just under 40% sodium by weight, so a 6 g serving (1 teaspoon) contains about 2,400 mg of sodium. Sodium serves a vital purpose in the human body: via its role as an electrolyte, it helps nerves and muscles to function correctly, and it is one factor involved in the osmotic regulation of water content in body organs (fluid balance).[63] Most of the sodium in the Western diet comes from salt.

Milk

Milk is a white liquid food produced by the mammary glands of mammals. It is the primary source of nutrition for young mammals (including breastfed human infants) before they are able to digest solid food. Milk contains many nutrients, including calcium and protein, as well as lactose and saturated fat. Immune factors and immune-modulating components in milk contribute to milk immunity. Early-lactation milk, which is called colostrum, contains antibodies and immune-modulating components that strengthen the immune system against many diseases. The US CDC agency recommends that children over the age of 12 months should have two servings of dairy milk products a day, and more than six billion people worldwide consume milk and milk products.

As an agricultural product, dairy milk is collected from farm animals, mostly cattle. In 2011, dairy farms produced around 730 million tonnes (800 million short tons) of milk from 260 million dairy cows. India is the world's largest producer of milk and the leading exporter of skimmed milk powder. New Zealand, Germany, and the Netherlands are the largest exporters of milk products. Between 750 and 900 million people live in dairy-farming households.

Types of consumption

There are two distinct categories of milk consumption: all infant mammals drink milk directly from their mothers' bodies, and it is their primary source of nutrition; and humans obtain milk from other mammals for consumption by humans of all ages, as one component of a varied diet.

Nutrition for infant mammals

In almost all mammals, milk is fed to infants through breastfeeding, either directly or by expressing the milk to be stored and consumed later. The early milk from mammals is called colostrum. Colostrum contains antibodies that provide protection to the newborn baby as well as nutrients and growth factors. The makeup of the colostrum and the period of secretion varies from species to species.For humans, the World Health Organization recommends exclusive breastfeeding for six months and breastfeeding in addition to other food for up to two years of age or more. In some cultures it is common to breastfeed children for three to five years, and the period may be longer.Fresh goats' milk is sometimes substituted for breast milk, which introduces the risk of the child

developing electrolyte imbalances, metabolic acidosis, megaloblastic anemia, and a host of allergic reactions.

2.5 Food Product for Humans

In many cultures, especially in the West, humans continue to consume milk beyond infancy, using the milk of other mammals (especially cattle, goats and sheep) as a food product. Initially, the ability to digest milk was limited to children as adults did not produce lactase, an enzyme necessary for digesting the lactose in milk. People therefore converted milk to curd, cheese, and other products to reduce the levels of lactose. Thousands of years ago, a chance mutation spread in human populations in northwestern Europe that enabled the production of lactase in adulthood. This mutation allowed milk to be used as a new source of nutrition which could sustain populations when other food sources failed. Milk is processed into a variety of products such as cream, butter, yogurt, kefir, ice cream and cheese. Modern industrial processes use milk to produce casein, whey protein, lactose, condensed milk, powdered milk, and many other food-additives and industrial products.

Whole milk, butter, and cream have high levels of saturated fat.The sugar lactose is found only in milk, and possibly in forsythia flowers and a few tropical shrubs. Lactase, the enzyme needed to digest lactose, reaches its highest levels in the human small intestine immediately after birth, and then begins a slow decline unless milk is consumed regularly. Those groups who continue to tolerate milk have often exercised great creativity in using the milk of domesticated ungulates, not only cattle, but also sheep, goats, yaks, water buffalo, horses, reindeer and camels. India is the largest producer and consumer of cattle milk and buffalo milk in the world.

What is Baking?

Baking is the final step in making yeast-leavened (bread, buns, rolls, crackers) and chemically-leavened products (cakes, cookies). It’s a thermal process that uses an oven, which transfers heat to the dough pieces via:

- Conduction through heated surfaces
- Convection through hot air
- Radiation from heat sources such as flames

The heat in turn activates a series of physicochemical changes, responsible for transforming the raw dough into a baked good with a firm, dry crust and a soft crumb.

Origin

Baking is probably as ancient as human kind. The first civilizations in recorded history, the Egyptians and Mesopotamian people, cultivated wheat. They learned the art and craft of baking bread after

discovering that wheat kernels could be eaten in a palatable form by grinding and turning them into flour, and then adding water to create paste which could be cooked and consumed. At the time, fire and manual work were key for the development of primitive baking processes.

How does it work?

Baking sets the final structure to baked goods. It involves simultaneous heat and mass transfer phenomena. The heat travels from the surrounding air into the interior of the dough or batter while moisture and other liquid compounds travel/escape from the core towards the exterior or surrounding air due to evaporation. While both yeast and chemical leaveners can result in gas development and volume build-up, yeast is essential for the development of unique flavors in breads and some baked goods.

Baking of Yeast-leavened Bakery Products (dough-based systems)

Coming out of the final proofer, the bread dough is well aerated with a typical internal temperature close to that of the proof box, around 35°C (95°F). As the dough pieces enter the oven, their surface temperature begins to increase and heat transfers slowly towards the core of the product. The oven temperature can be set, according to the type of product being processed, at any point between 200–300°C (390–570°F). In general, there are three major stages in the baking process: expansion of the dough, drying of the surface, and crust browning. These can be subdivided into the following stages (in the order of temperature increase):

1. **Formation and expansion of gases (oven spring)**. A rapid rise in volume takes place at the beginning of baking at a core temperature of 35–70 °C (95–158°F). This rise creates the oven spring. Five events occur simultaneously to produce the oven spring in the first 5–8 minutes of baking:

- Yeast reaches its maximum fermentation rate and generates carbon dioxide, CO_2 gas (CO_2 is also produced by chemical leavening).
- Release of carbon dioxide gas from the saturated liquid dough phase into the surrounding gas cells.
- Expansion of the gasses trapped in cells (nitrogen from air and CO_2) and generated during mixing, makeup, and proofing.
- Evaporation of water/ethanol mixture.

2. **Killing of yeast and other microorganisms**. This usually occurs at an internal temperature of 60–70°C (140–160°F) where the cells can no longer contribute to the gas production or volume increase.

3. **Gelatinization of starch**. At 76°C (170°F), starch begins to gelatinize as granules become fully swollen with local free water. Thanks to starch gelatinization and protein denaturation, the dough is converted into bread and a structure is set.
4. **Coagulation/denaturation of gluten (egg or other) proteins** that make up the continuous phase. From 60 to 70°C (140 to 160°F), the proteins begin to denature. As a consequence, gluten becomes increasingly tough and stiff as it irreversibly forms a gel. Moisture loss also imparts rigidity to the product being baked.

2.6 Melting Point of a Fat

The melting point is one of the most important physical properties of a chemical compound and it plays a significant role in determining possible applications. For fatty acid esters the melting point is essential for a variety of food and non-food applications,The melting point of a fat corresponds to the melting point of the β form which is the most stable polymorphic form and is the temperature at which all the solids melt. When short chain or unsaturated acids are present, the melting point is reduced. The melting point is of great importance in the processing of animal fats. The melting points of pure fats are very precise, but since fats or oils are made up of a mixture of lipids with different melting points we have to refer to the melting zone which is defined as the melting point of the fat component. the fat that melts at a higher temperature.

The melting point of visceral fat was 30° C–35 °C. In the more peripheric parts the melting points were lower. At the foot melting points of from 0 °C–10 °C were often found, in 11 out of 15 persons the melting point was below 10° C. One single person was examined in whom the results were widely different from the others. He was a sea stoker, exposed to high temperatures in his daily work, and all the melting points observed in this man were extremely high.

2.6.1 Physical Properties of Oils and Fats

The analysis of the physical properties of oils and fats allows us to understand the behavior and characteristics of these elements, as well as their differences. For this, the crystallization, the melting point, the viscosity, the refractive index, the density, the solubility, the plasticity and the emulsifying capacity will be analyzed. Here we provide more detail on each of these. **2.6.2Crystallization of Fats**

Fats differ from oils in their degree of solidification at room temperature, since in these conditions the oils are in a liquid state (not crystallized) while the fats are in the solid (crystallized) state. The proportion of crystals in fats have great importance in determining the physical properties of a product. Fats are considered solid when they have at least 10% of their crystallized components. The fat

crystals have a size between 0.1 and 0.5 μm and can occasionally reach up to 100 μm. The crystals are maintained by Van der Waalls forces forming a three-dimensional network that provides rigidity to the product. An important feature of fat is its crystalline polymorphism since mono-di and triglyceride crystallize in different crystalline forms (α, β, β').For instance, in edible oils, a high melting point indicates a higher content of saturated fats, impacting their cooking behavior and shelf life. Similarly, in lubricants, the melting point influences flow properties at different temperatures, affecting their effectiveness in various applications.

2.6.3 Non-dietary Uses

Only a small percentage of the salt manufactured in the world is used in food. The remainder is used in agriculture, water treatment, chemical production, de-icing, and other industrial use cases. Sodium chloride is one of the largest volume inorganic raw materials. It is a feedstock in the production of caustic soda and chlorine. These are used in the manufacture of PVC, paper pulp and many other inorganic and organic compounds. Salt is also used as a flux in the production of aluminium. For this purpose, a layer of melted salt floats on top of the molten metal and removes iron and other metal contaminants. It is also used in the manufacture of soaps and glycerine, where it is used to saponify fats. As an emulsifier, salt is used in the manufacture of synthetic rubber, and another use is in the firing of pottery, when salt added to the furnace vaporises before condensing onto the surface of the ceramic material, forming a strong glaze.

2.7 Leavening

A leavening agent is a substance that causes dough to expand by releasing gas once mixed with liquid, acid or heat. Rising agents give baked goods optimal volume, texture and crumb and can include baking soda or baking powder, whipped egg whites or cream, active or instant dry yeast, and even steam.Leavening adds volume to your baked goods, whether you're baking bread, cake or cookies. The trapped air that is formed by the leavening process creates a more tender and open crumb in your breads and cakes and provides a more pleasant texture and mouthfeel. Without leavening, your desserts and breads will not rise and the product will be too dense.

There are four main types of leavening agents and describes how each has its own purpose. Using the correct leavening agent will help deliver the most desirable results for the type of baked goods you are making. Your recipes will call for the agents that work best for baking, or bread dough that requires kneading and a long, slow fermenting and rising time. A natural leavening agent is a yeast substance that produces fermentation in bread dough or batter, making the dough rise. Naturally leavened bread is easily achieved by letting flour and water ferment. The most common types of natural leaveners include chemical, biological, physical and mechanical.

2.7.1 Chemical Leaveners

A chemical leavener is a compound or a mixture that is added to dough or batter and releases gases when it reacts with moisture or heat. When a chemical leavener such as baking soda is mixed with an acidic liquid such as buttermilk, yogurt, honey, or lemon juice it reacts quickly, expanding and creating volume in the dough. The word chemical simply describes the process of combining ingredients to produce a reaction, as in chemistry, and has nothing to do with harmful substances. Without chemical leavening, we wouldn't be able to enjoy cookies, cakes and quick breads.

Chemical leaveners are what make quick breads like banana bread rise quickly as it bakes and gives it a delicate, tender crumb. They also dictate whether a cookie is soft, chewy or crispy and they can help create the lightest, fluffiest buttermilk biscuits.It's important to follow a recipe precisely, as adding too much of a chemical leavener can cause the dough or batter to over rise and leave a bitter taste.Baked goods that require chemical leaveners include:

- Cake
- Coffee Cake
- Cookies
- Muffins
- Brownies
- Dessert Bars
- Biscuits
- Corn Bread
- Doughnuts
- Pancakes & Waffles

2.7.2 List of Chemical Leavening Agents

Here are the most commonly used chemical leavening agents that you might find by themselves or combined in recipes for cakes, cookies and quick breads.

- **Baking soda** is also called bicarbonate of soda or sodium bicarbonate. When combined with an acid, carbon dioxide gas forms, producing bubbles that make the dough or batter rise.
- **Baking powder** is a dry mixture made of a base of carbonate or bicarbonate and a weak acid. It is used to increase the volume and lighten the texture of baked goods.
  - ✓ **Single-acting baking powder** reacts when hydrated and does not need heat to react.
  - ✓ **Double-acting baking powder** reacts when hydrated and reacts again when heat is introduced.

- Bakers' ammonia is also called ammonium carbonate; it makes baked goods such as low moisture cookies and crackers light and crisp.

2.8 Killer of Yeast

A killer yeast is a yeast, such as *Saccharomyces cerevisiae*, which is able to secrete one of a number of toxic proteins which are lethal to susceptible cells. These "killer toxins" are polypeptides that kill sensitive cells of the same or related species, often functioning by creating pores in target cell membranes. These yeast cells are immune to the toxic effects of the protein due to an intrinsic immunity.Killer yeast strains can be a problem in commercial processing because they can kill desirable strains. The killer yeast system was first described in 1963. Study of killer toxins helped to better understand the secretion pathway of yeast, which is similar to those of more complex eukaryotes. It also can be used in treatment of some diseases, mainly those caused by fungi.

Saccharomyces cerevisiae

The best characterized toxin system is from yeast (*Saccharomyces cerevisiae*), which was found to spoil brewing of beer. In *S. cerevisiae* are toxins encoded by a double-stranded RNA virus, translated to a precursor protein, cleaved and secreted outside of the cells, where they may affect susceptible yeast. There are other killer systems in *S. cerevisiae*, such as KHR1 and KHS1 genes encoded on chromosomes IX and V, respectively.

RNA Virus

The virus, L-A, is an icosahedral virus of *S. cerevisiae* comprising a 4.6 kb genomic segment and several satellite double-stranded RNA sequences, called M dsRNAs. The genomic segment encodes for the viral coat protein and a protein which replicates the viral genomes. The M dsRNAs encode the toxin, of which there are at least three variants in *S. cerevisiae*, and many more variants across all species.

L-A virus uses yeast Ski complex (super killer) and MAK (maintenance of killer) chromosomal genes for its preservation in the cell. The virus is not released into the environment. It spreads between cells during yeast mating. The family of *Totiviridae* in general helps M-type dsRNAs in a wide variety of yeasts.

2.9 Toxins

The initial protein product from translation of the M dsRNA is called the preprotoxin, which is targeted to the yeast secretory pathway. The preprotoxin is processed and cleaved to produce an α/β dimer, which is the active form of the toxin, and is released into the environment.The two most

studied variant toxins in *S. cerevisiae* are K1 and K28. There are numerous appearently unrelated M dsRNAs, their only similarity being their genome and preprotoxin organization. K1 binds to the β-1,6-D-glucan receptor on the target cell wall, moves inside, and then binds to the plasma membrane receptor Kre1p. It forms a cation-selective ion channel in the membrane, which is lethal to the cell.

K28 uses the α-1,6-mannoprotein receptor to enter the cell, and utilizes the secretory pathway in reverse by displaying the endoplasmic reticulum HDEL signal. From the ER, K28 moves into the cytoplasm and shuts down DNA synthesis in the nucleus, triggering apoptosis.

2.9.1Killing of Microorganisms

Control of microorganisms is essential in order to prevent the transmission of diseases and infection, stop decomposition and spoilage, and prevent unwanted microbial contamination. Microorganisms are controlled by means of physical agents and chemical agents. Physical agents include such methods of control as high or low temperature, desiccation, osmotic pressure, radiation, and filtration. Control by chemical agents refers to the use of disinfectants, antiseptics, antibiotics, and chemotherapeutic antimicrobial chemicals. In this unit we will concentrate on the chemical control of microbial growth with a special emphasis on the antibiotics and chemotherapeutic antimicrobial chemicals used in treating bacterial infections. Control of microorganisms by means of physical agents will be control by means of disinfectants, antiseptics, and sanitizers.

The basis of chemotherapeutic control of bacteria is selective toxicity. Selective toxicity means that the chemical being used should inhibit or kill the intended pathogen without seriously harming the host. A broad spectrum agent is one generally effective against a variety of Gram-positive and Gram-negative bacteria; a narrow spectrum agent generally works against just Gram-positives, Gram-negatives, or only a few bacteria. As mentioned above, such agents may be cidal or static in their action. A cidal agent kills the organism while a static agent inhibits the organism's growth long enough for body defenses to remove it.

There are two categories of antimicrobial chemotherapeutic agents: antibiotics and synthetic drugs. Antibiotics are metabolic products of one microorganism that inhibit or kill other microorganisms. Chemotherapeutic synthetic drugs are antimicrobial drugs synthesized by chemical procedures in the laboratory. Many of today's antibiotics are now actually semi-synthetic and some are even made synthetically. Antibiotics are metabolic products of one microorganism that inhibit or kill other

microorganisms. Why then do bacteria produce antibiotics? There is growing support for multiple actions for microbial antibiotic production:

- If produced in large enough amounts, antibiotics may be used as a weapon to inhibit or kill other microbes in the vicinity to reduce competition for food.
- Antibiotics produced in sublethal quantities may function as interspecies quorum sensing molecules enabling a number of different bacteria to form within a common biofilm where metabolic end products of one organism may serve as a substrate for another. All the organisms are protected within the same biofilm.
- Antibiotics produced in sublethal quantities may function as interspecies quorum sensing molecules enabling some bacteria to manipulate others to become motile and swim away thus reducing the competition for food.
- Antibiotics action may result in the degradation of bacterial cell walls or DNA and these products can act as cues that trigger other bacteria to produce a protective biofilm.
- Antibiotics produced in sublethal quantities may trigger intraspecies quorum sensing. Exposure to low concentrations of an antibiotic may trigger bacteria to produce quorum sensing molecules that trigger the population to produce a protective biofilm. The biofilm then protects the population from greater concentrations of the antibiotic.

2.10 Immunity

Goldstein (2001) claimed that K1 inhibits the TOK1 membrane potassium channel before secretion, and although the toxin reenters through the cell wall it is unable to reactivate TOK1. However Breinig, Tipper and Schmitt (2002) showed that the TOK1 channel was not the primary receptor for K1, and that TOK1 inhibition does not confer immunity. Vališ, Mašek, Novotná, Pospíšek and Janderová (2006) experimented with mutants which produce K1 but do not have immunity to it, and suggested that cell membrane receptors were being degraded in the secretion pathway of immune cells, apparently due to the actions of unprocessed α chains.

Kluyveromyces lactis

Killer properties of *Kluyveromyces lactis* are associated with linear DNA plasmids, which have on their 5'end associated proteins, which enable them to replicate themselves, in a way similar to adenoviruses. It is an example of protein priming in DNA replication. MAK genes are not known. The toxin consists of three subunits, which are matured in golgi complex by signal

peptidase and glycosylated.The mechanism of action appears to be the inhibition of adenylate cyclase in sensitive cells. Affected cells are arrested in G1 phase and lose viability.

Other yeast

Other toxin systems are found in other yeasts:

- *Pichia* and *Williopsis*
- *Hanseniasporauvarum*
- *Zygosaccharomyces bailii*
- *Ustilago maydis*: a smut fungus that produces killer toxin Kp4 family fungal killer toxins.
- *Debaryomyceshansenii*

Use of toxins

The susceptibility to toxins varies greatly between yeast species and strains. Several experiments have made use of this to reliably identify strains. Morace, Archibusacci, Sestito and Polonelli (1984) used the toxins produced by 25 species of yeasts to differentiate between 112 pathogenic strains, based on their sensitivity to each toxin. This was extended by Morace *et al*. (1989) to use toxins to differentiate between 58 bacterial cultures. Vaughan-Martini, Cardinali and Martini (1996) used 24 strains of killer yeast from 13 species to find a resistance signature for each of 13 strains of *S. cerevisiae* which were used as starters in wine-making. It was shown that sensitivity to toxins could be used to discriminate between 91 strains of *Candida albicans* and 223 other *Candida* strains.

2.11 Bread, Preparation & Formulation

Bread is a staple food prepared from a dough of flour (usually wheat) and water, usually by baking. Throughout recorded history and around the world, it has been an important part of many cultures' diet. It is one of the oldest human-made foods, having been of significance since the dawn of agriculture, and plays an essential role in both religious rituals and secular culture.Bread may be leavened by naturally occurring microbes (e.g. sourdough), chemicals (e.g. baking soda), industrially produced yeast, or high-pressure aeration, which creates the gas bubbles that fluff up bread. In many countries, commercial bread often contains additives to improve flavor, texture, color, shelf life, nutrition, and ease of production.

Bread is one of the oldest prepared foods. Evidence from 30,000 years ago in Europe and Australia revealed starch residue on rocks used for pounding plants. It is possible that during this time, starch extract from the roots of plants, such as cattails and ferns, was spread on a flat rock, placed over a fire and cooked into a primitive form of flatbread. The oldest evidence of bread-making has been found in a 14,500-year-old Natufian site in Jordan's northeastern desert. Around 10,000 BC, with the dawn of

the Neolithic age and the spread of agriculture, grains became the mainstay of making bread. Yeast spores are ubiquitous, including on the surface of cereal grains, so any dough left to rest leavens naturally.

Types

Bread is the staple food of the Middle East, Central Asia, North Africa, Europe, and in European-derived cultures such as those in the Americas, Australia, and Southern Africa. This is in contrast to parts of South and East Asia, where rice or noodles are the staple. Bread is usually made from a wheat-flour dough that is cultured with yeast, allowed to rise, and baked in an oven. Carbon dioxide and ethanol vapors produced during yeast fermentation result in bread's air pockets. Owing to its high levels of gluten (which give the dough sponginess and elasticity), common or bread wheat is the most common grain used for the preparation of bread, which makes the largest single contribution to the world's food supply of any food.

Nutritional Significance

Bread is a good source of carbohydrates and micronutrients such as magnesium, iron, selenium, and B vitamins. Whole grain bread is a good source of dietary fiber and all breads are a common source of protein in the diet, though not a rich one.

Preparation

Doughs are usually baked, but in some cuisines breads are steamed (e.g., mantou), fried (e.g., puri), or baked on an unoiled frying pan (e.g., tortillas). It may be leavened or unleavened (e.g. matzo). Salt, fat and leavening agents such as yeast and baking soda are common ingredients, though bread may contain other ingredients, such as milk, egg, sugar, spice, fruit (such as raisins), vegetables **(such** as onion), nuts (such as walnut) or seeds (such as poppy).Methods of processing dough into bread include the straight dough process, the sourdough process, the Chorleywood bread process and the sponge and dough process.

Formulation

Professional bread recipes are stated using the baker's percentage notation. The amount of flour is denoted to be 100%, and the other ingredients are expressed as a percentage of that amount by weight. Measurement by weight is more accurate and consistent than measurement by volume, particularly for dry ingredients. The proportion of water to flour is the most important measurement in a bread recipe, as it affects texture and crumb the most. Hard wheat flours absorb about 62% water, while softer wheat flours absorb about 56%.Common table breads made from these doughs result in a finely textured, light bread. Most artisan bread formulas contain anywhere from 60 to 75% water. In yeast breads, the

higher water percentages result in more CO_2 bubbles and a coarser bread crumb. Dough recipes commonly call for 500 grams of flour, which yields a single loaf of bread or two baguettes. Calcium propionate is commonly added by commercial bakeries to retard the growth of molds.

2.12 Flour

Wheat flour is unique among cereal flours in that, when mixed with water in the correct proportions, its protein component forms an elastic network capable of holding gas and developing a firm spongy structure when baked. The proteinaceous substances contributing these properties are known collectively as gluten. The suitability of a flour for a given purpose is determined by the type and amount of its gluten content. Those characteristics are controlled by the genetic constitution and growing conditions of the wheat from which the flour was milled, as well as the milling treatment applied. Low-protein, soft-wheat flour is appropriate for cakes, pie crusts, cookies (sweet biscuits), and other products not requiring great expansion and elastic structure. High-protein, hard-wheat flour is adapted to bread, hard rolls, soda crackers, and Danish pastry, all requiring elastic dough and often expanded to low densities by the leavening action.

Flour**,** finely ground cereal grains or other starchy portions of plants, used in various food products and as a basic ingredient of baked goods. Flour made from wheat grains is the most satisfactory type for baked products that require spongy structure. In modern usage, the word flour alone usually refers to wheat flour, the major type in Western countries.

Wheat grains, or kernels, are composed of the starchy endosperm, or food-storage portion, constituting about 85 percent; several outer layers that make up the bran, constituting about 13 percent; and the oily germ, or embryo plant, approximately 2 percent. In the production of refined flour, the purpose of the milling process is to separate the endosperm from the other kernel portions. In the production of whole wheat flour, all parts of the kernel are used.

In modern milling of refined flours the wheat kernels are cleaned and tempered by the addition or removal of moisture and then split open by a pair of rolls. The finest particles, called break flour, are sieved out and bagged. Coarser particles of endosperm (called semolina) and pieces of bran with endosperm attached are then subjected to a series of rolls in which semolina of steadily reducing size is gradually ground to flour and the bran separated out. The flour is usually bleached and treated to obtain the improved bread-making qualities formerly achieved by natural aging. Flour grades are based on the residual amount of branny particles.

When flour is mixed with water to make dough, its protein content is converted to gluten, an elastic substance that forms a continuous network throughout the dough and is capable of retaining gas, thus causing the baked product to expand, or rise. The strength of the gluten depends upon the protein content of the flour. Soft wheats, containing approximately 8–12 percent protein, produce flours that are suitable for products requiring minimal structure, such as cakes, cookies (sweet biscuits), piecrusts, and crackers. Hard wheats, which are high in protein (approximately 12–15 percent), produce flours that are suitable for products requiring stronger structure, such as breads, buns, hard rolls, and yeast-raised sweet rolls.

The wide variety of wheat flours generally available includes whole wheat, or graham, flour, made from the entire wheat kernel and often unbleached; gluten flour, a starch-free, high-protein, whole wheat flour; all-purpose flour, refined (separated from bran and germ), bleached or unbleached, and suitable for any recipe not requiring a special flour; cake flour, refined and bleached, with very fine texture; self-rising flour, refined and bleached, with added leavening and salt; and enriched flour, refined and bleached, with added nutrients.

Flours are also made from other starchy plant materials including barley, buckwheat, chickpeas, lima beans, oats, peanuts, potatoes, soybeans, rice, and rye. Gluten-free flour and related products became popular in the 21st century, as consumers and restaurants became increasingly sensitive to digestive disorders and food allergies.

2.13 Yeast

All commercial breads, except salt-rising types and some rye bread, are leavened with bakers' yeast, composed of living cells of the yeast strain *Saccharomyces cerevisiae*. A typical yeast addition level might be 2 percent of the dough weight. Bakeries receive yeast in the form of compressed cakes containing about 70 percent water or as dry granules containing about 8 percent water. Dry yeast, more resistant to storage deterioration than compressed yeast, requires rehydration before it is added to the other ingredients. "Cream" yeast, a commercial variety of bakers' yeast made into a fluid by the addition of extra water, is more convenient to dispense and mix than compressed yeast, but it also has a shorter storage life and requires additional equipment for handling.

Bakers' yeast performs its leavening function by fermenting such sugars as glucose, fructose, maltose, and sucrose. It cannot use lactose, the predominant sugar of milk, or certain other carbohydrates. The principal products of fermentation are carbon dioxide, the leavening agent, and ethanol, an important

component of the aroma of freshly baked bread. Other yeast activity products also flavour the baked product and change the dough's physical properties.

The rate at which gas is evolved by yeast during the various stages of dough preparation is important to the success of bread manufacture. Gas production is partially governed by the rate at which fermentable carbohydrates become available to the yeast. The sugars naturally present in the flour and the initial stock of added sugar are rapidly exhausted. A relatively quiescent period follows, during which the yeast cells become adapted to the use of maltose, a sugar constantly being produced in the dough by the action of diastatic enzymes on starch. The rate of yeast activity is also governed by temperature and osmotic pressure, the latter primarily a function of the water content and salt concentration.

Shortening

Fats and oils are essential ingredients in nearly all bakery products. Shortenings have a tenderizing effect in the finished product and often aid in the manipulation of doughs. In addition to modifying the mouth feel or texture, they often add flavour of their own and tend to round off harsh notes in some of the spice flavours.

The common fats used in bakery products are lard, beef fats, and hydrogenated vegetable oils. Butter is used in some premium and specialty products as a texturizer and to add flavour, but its high cost precludes extensive use. Cottonseed oil and soybean oil are the most common processed vegetable oils used. Corn, peanut, and coconut oils are used to a limited extent; fats occurring in other ingredients, such as egg yolks, chocolate, and nut butters, can have a shortening effect if the ingredients are present in sufficient quantity.

Breads and rolls often contain only 1 or 2 percent shortening; cakes will have 10 to 20 percent; Danish pastries prepared according to the authentic formula may have about 30 percent; pie crusts may contain even more. High usage levels require those shortenings that melt above room temperature; butter and liquid shortenings, with their lower melting point, tend to leak from the product.Commercial shortenings may include antioxidants, to retard rancidity, and emulsifiers, to improve the shortening effect. Colours and flavours simulating butter may also be added. Margarines, emulsions of fat, water, milk solids, and salt, are popular bakery ingredients. Fats of any kind have a destructive effect on meringues and other protein-based foams; small traces of oil left on the mixing utensils can deflate an angel food cake to unacceptably high density.

Bread Improvers

Bread improvers and dough conditioners are often used in producing commercial breads to reduce the time needed for rising and to improve texture and volume and to give antistaling effects. The substances used may be oxidising agents to strengthen the dough or reducing agents to develop gluten and reduce mixing time, emulsifiers to strengthen the dough or to provide other properties such as making slicing easier, or enzymes to increase gas production.

2.14 Summary

Under this unit we have summarized the concepts of gluten, additives, its uses, flavor boosters and enhancers, chemical leaveners, toxins, bread preparation & formulation etc. Additives play an important role in the bakery industry, enhancing the taste, texture, appearance and preservation of baked goods. However, it is important to be aware of the potential health concerns associated with certain additives and to check the ingredients list on bakery products. Consumers can also opt for homemade baked goods or products from bakeries that use natural or minimally processed ingredients.

The use of additives in bakery products can have a significant impact on human health, the environment, and small and local businesses. While additives can be beneficial in enhancing the quality and safety of bakery products, it is important to be aware of the types of additives used and to consume them in moderation. Consumers can make a difference by choosing to purchase bakery products from small and local bakeries that use natural and organic ingredients and traditional methods, which can result in more flavorful and healthier products. Supporting small and local bakeries can also help to promote the use of natural and additive-free bakery products and can help to support the local economy.

Bread baking is one of the most important discoveries of mankind. Bread is made by baking dough which has for its main ingredients wheat flour, water, yeast and salt. Other ingredients which may be added include flours of other cereals, milk and milk products, fruits, gluten, etc. When these ingredients are mixed in correct proportions two processes commence: (i) the protein in flour begins to hydrate and forms a cohesive mass called as gluten (ii) evolution of carbon dioxide gas by action of the enzymes in the yeast upon the sugars. Three main requirements in making bread from wheat flour are formation of gluten network, aeration of the mixture by incorporation of gas, and coagulation of the material by heating it in the oven.

2.15 Terminal questions

Q. 1 What do you mean by additives? Explain it.

Answer:----------

Q. 2 Describe chemical leavening agents with its list.

Answer:----------

Q. 3 Describe flavor boosters and enhancers.

Answer:----------

Q. 4 Write short notes on the following.

(a) Gluten

(b) Additives

Answer:----------

Q. 5 Write a short notes on toxins.

Answer:----------

Q. 6 Describe about bread, its preparation & formulation.

Answer:----------

Further readings

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

Unit- 3: Preparation and Quality Evaluation of Bread, Bun, Pastries Cakes, Cake Decoration and Modified Bakery Products

Structure

Objectives

3.1 Introduction

3.2 Bread, Preparation & Formulation

3.3 Flour

3.4 Yeast

3.5 What is Bread Processing?

3.5.1 Bread Processing/Bread Manufacture Process

3.5.2 Mixing

3.5.3 Fermentation

3.6 Different Types of Breads

3.7 Chapatti (chapatti)

3.8 Pastries

3.9 Types

3.10 Cakes

3.11 Summary

3.12 Terminal questions

Further readings

3.1 Introduction

Consumption of cereals has been an integral part of human civilization since time immemorial. Cereals cooked in different ways reflect progress of mankind. Baking, as it is known today, was introduced in India in 18th century and was confined to section of the society. However, nowadays because of awareness, baked products such as bread, cakes, biscuits etc are consumed in almost every household in India. The changes undergone by a dough or batter, as it bakes in the oven by hot air is called as baking process. Some of the examples of baked products are biscuits, cakes, puffs, bread, bun, soup sticks, cookies, macrons, pastries, pizza base etc. Some gases are already present in the dough, as in proofed bread dough and in sponge cake batters.

As they are heated, the gases expand and leaven the product. Some gases are not formed until heat is applied. Fast acting baking powder form gases rapidly when first placed in the oven. Steam is also formed as the moisture in the dough is heated. Gases are formed and trapped in the network formed by the proteins in the dough. These proteins are primarily gluten and sometimes egg protein. Without gluten or egg protein, the gases would escape and product would not be leavened. At the right temperature protein coagulate or solidify giving a structure to the baked products. Hence maintaining correct baking temperature is very important.

Objectives

This is the third unit (Preparation and Quality Evaluation of Bread, Bun, Pastries Cakes, Cake Decoration and Modified Bakery Products) of first block (An Overview of Bakery Industry, Preparation and Quality Evaluation of Bread and its Products). After studying this unit, you will be able to:

- To introduce flour, yeast and fermentation
- To discuss bread processing/bread manufacture process.
- To discuss different types of breads and chapatti.
- To discuss pastries, cakes and their types.

3.2 Bread, Preparation & Formulation

Bread is a staple food prepared from a dough of flour (usually wheat) and water, usually by baking. Throughout recorded history and around the world, it has been an important part of many cultures' diet. It is one of the oldest human-made foods, having been of significance since the dawn of agriculture, and plays an essential role in both religious rituals and secular culture. Bread may be leavened by naturally occurring microbes (e.g. sourdough), chemicals (e.g. baking soda), industrially

produced yeast, or high-pressure aeration, which creates the gas bubbles that fluff up bread. In many countries, commercial bread often contains additives to improve flavor, texture, color, shelf life, nutrition, and ease of production.

Bread is one of the oldest prepared foods. Evidence from 30,000 years ago in Europe and Australia revealed starch residue on rocks used for pounding plants. It is possible that during this time, starch extract from the roots of plants, such as cattails and ferns, was spread on a flat rock, placed over a fire and cooked into a primitive form of flatbread. The oldest evidence of bread-making has been found in a 14,500-year-old Natufian site in Jordan's northeastern desert. Around 10,000 BC, with the dawn of the Neolithic age and the spread of agriculture, grains became the mainstay of making bread. Yeast spores are ubiquitous, including on the surface of cereal grains, so any dough left to rest leavens naturally.

3.2.1 Types

Bread is the staple food of the Middle East, Central Asia, North Africa, Europe, and in European-derived cultures such as those in the Americas, Australia, and Southern Africa. This is in contrast to parts of South and East Asia, where rice or noodles are the staple. Bread is usually made from a wheat-flour dough that is cultured with yeast, allowed to rise, and baked in an oven. Carbon dioxide and ethanol vapors produced during yeast fermentation result in bread's air pockets. Owing to its high levels of gluten (which give the dough sponginess and elasticity), common or bread wheat is the most common grain used for the preparation of bread, which makes the largest single contribution to the world's food supply of any food.

3.2.2 Nutritional Significance

Bread is a good source of carbohydrates and micronutrients such as magnesium, iron, selenium, and B vitamins. Whole grain bread is a good source of dietary fiber and all breads are a common source of protein in the diet, though not a rich one.

3.2.3 Preparation

Doughs are usually baked, but in some cuisines breads are steamed (e.g., mantou), fried (e.g., puri), or baked on an unoiled frying pan (e.g., tortillas). It may be leavened or unleavened (e.g. matzo). Salt, fat and leavening agents such as yeast and baking soda are common ingredients, though bread may contain other ingredients, such as milk, egg, sugar, spice, fruit (such as raisins), vegetables (such as onion), nuts (such as walnut) or seeds (such as poppy). Methods of processing dough into bread include the straight dough process, the sourdough process, the Chorleywood bread process and the sponge and dough process.

Formulation

Professional bread recipes are stated using the baker's percentage notation. The amount of flour is denoted to be 100%, and the other ingredients are expressed as a percentage of that amount by weight. Measurement by weight is more accurate and consistent than measurement by volume, particularly for dry ingredients. The proportion of water to flour is the most important measurement in a bread recipe, as it affects texture and crumb the most. Hard wheat flours absorb about 62% water, while softer wheat flours absorb about 56%.Common table breads made from these doughs result in a finely textured, light bread. Most artisan bread formulas contain anywhere from 60 to 75% water. In yeast breads, the higher water percentages result in more CO_2 bubbles and a coarser bread crumb. Dough recipes commonly call for 500 grams of flour, which yields a single loaf of bread or two baguettes. Calcium propionate is commonly added by commercial bakeries to retard the growth of molds.

3.3 Flour

Wheat flour is unique among cereal flours in that, when mixed with water in the correct proportions, its protein component forms an elastic network capable of holding gas and developing a firm spongy structure when baked. The proteinaceous substances contributing these properties are known collectively as gluten. The suitability of a flour for a given purpose is determined by the type and amount of its gluten content. Those characteristics are controlled by the genetic constitution and growing conditions of the wheat from which the flour was milled, as well as the milling treatment applied. Low-protein, soft-wheat flour is appropriate for cakes, pie crusts, cookies (sweet biscuits), and other products not requiring great expansion and elastic structure. High-protein, hard-wheat flour is adapted to bread, hard rolls, soda crackers, and Danish pastry, all requiring elastic dough and often expanded to low densities by the leavening action.

Flour, finely ground cereal grains or other starchy portions of plants, used in various food products and as a basic ingredient of baked goods. Flour made from wheat grains is the most satisfactory type for baked products that require spongy structure. In modern usage, the word flour alone usually refers to wheat flour, the major type in Western countries.

Wheat grains, or kernels, are composed of the starchy endosperm, or food-storage portion, constituting about 85 percent; several outer layers that make up the bran, constituting about 13 percent; and the oily germ, or embryo plant, approximately 2 percent. In the production of refined flour, the purpose of the milling process is to separate the endosperm from the other kernel portions. In the production of whole wheat flour, all parts of the kernel are used.

In modern milling of refined flours the wheat kernels are cleaned and tempered by the addition or removal of moisture and then split open by a pair of rolls. The finest particles, called break flour, are sieved out and bagged. Coarser particles of endosperm (called semolina) and pieces of bran with endosperm attached are then subjected to a series of rolls in which semolina of steadily reducing size is gradually ground to flour and the bran separated out. The flour is usually bleached and treated to obtain the improved bread-making qualities formerly achieved by natural aging. Flour grades are based on the residual amount of branny particles.

When flour is mixed with water to make dough, its protein content is converted to gluten, an elastic substance that forms a continuous network throughout the dough and is capable of retaining gas, thus causing the baked product to expand, or rise. The strength of the gluten depends upon the protein content of the flour. Soft wheats, containing approximately 8–12 percent protein, produce flours that are suitable for products requiring minimal structure, such as cakes, cookies (sweet biscuits), piecrusts, and crackers. Hard wheats, which are high in protein (approximately 12–15 percent), produce flours that are suitable for products requiring stronger structure, such as breads, buns, hard rolls, and yeast-raised sweet rolls.

The wide variety of wheat flours generally available includes whole wheat, or graham, flour, made from the entire wheat kernel and often unbleached; gluten flour, a starch-free, high-protein, whole wheat flour; all-purpose flour, refined (separated from bran and germ), bleached or unbleached, and suitable for any recipe not requiring a special flour; cake flour, refined and bleached, with very fine texture; self-rising flour, refined and bleached, with added leavening and salt; and enriched flour, refined and bleached, with added nutrients.

Flours are also made from other starchy plant materials including barley, buckwheat, chickpeas, lima beans, oats, peanuts, potatoes, soybeans, rice, and rye. Gluten-free flour and related products became popular in the 21st century, as consumers and restaurants became increasingly sensitive to digestive disorders and food allergies.

Leavening Agents

Pie doughs and similar products are usually unleavened, but most bakery products are leavened, or aerated, by gas bubbles developed naturally or folded in. Leavening may result from yeast or bacterial fermentation, from chemical reactions, or from the distribution in the batter of atmospheric or injected gases.

3.4 Yeast

All commercial breads, except salt-rising types and some rye bread, are leavened with bakers' yeast, composed of living cells of the yeast strain *Saccharomyces cerevisiae*. A typical yeast addition level might be 2 percent of the dough weight. Bakeries receive yeast in the form of compressed cakes containing about 70 percent water or as dry granules containing about 8 percent water. Dry yeast, more resistant to storage deterioration than compressed yeast, requires rehydration before it is added to the other ingredients. "Cream" yeast, a commercial variety of bakers' yeast made into a fluid by the addition of extra water, is more convenient to dispense and mix than compressed yeast, but it also has a shorter storage life and requires additional equipment for handling.

Bakers' yeast performs its leavening function by fermenting such sugars as glucose, fructose, maltose, and sucrose. It cannot use lactose, the predominant sugar of milk, or certain other carbohydrates. The principal products of fermentation are carbon dioxide, the leavening agent, and ethanol, an important component of the aroma of freshly baked bread. Other yeast activity products also flavour the baked product and change the dough's physical properties.

The rate at which gas is evolved by yeast during the various stages of dough preparation is important to the success of bread manufacture. Gas production is partially governed by the rate at which fermentable carbohydrates become available to the yeast. The sugars naturally present in the flour and the initial stock of added sugar are rapidly exhausted. A relatively quiescent period follows, during which the yeast cells become adapted to the use of maltose, a sugar constantly being produced in the dough by the action of diastatic enzymes on starch. The rate of yeast activity is also governed by temperature and osmotic pressure, the latter primarily a function of the water content and salt concentration.

Shortening

Fats and oils are essential ingredients in nearly all bakery products. Shortenings have a tenderizing effect in the finished product and often aid in the manipulation of doughs. In addition to modifying the mouth feel or texture, they often add flavour of their own and tend to round off harsh notes in some of the spice flavours.The common fats used in bakery products are lard, beef fats, and hydrogenated vegetable oils. Butter is used in some premium and specialty products as a texturizer and to add flavour, but its high cost precludes extensive use. Cottonseed oil and soybean oil are the most common processed vegetable oils used. Corn, peanut, and coconut oils are used to a limited extent; fats occurring in other ingredients, such as egg yolks, chocolate, and nut butters, can have a shortening effect if the ingredients are present in sufficient quantity.

Breads and rolls often contain only 1 or 2 percent shortening; cakes will have 10 to 20 percent; Danish pastries prepared according to the authentic formula may have about 30 percent; pie crusts may contain even more. High usage levels require those shortenings that melt above room temperature; butter and liquid shortenings, with their lower melting point, tend to leak from the product. Commercial shortenings may include antioxidants, to retard rancidity, and emulsifiers, to improve the shortening effect. Colours and flavours simulating butter may also be added. Margarines, emulsions of fat, water, milk solids, and salt, are popular bakery ingredients. Fats of any kind have a destructive effect on meringues and other protein-based foams; small traces of oil left on the mixing utensils can deflate an angel food cake to unacceptably high density.

Bread Improvers

Bread improvers and dough conditioners are often used in producing commercial breads to reduce the time needed for rising and to improve texture and volume and to give antistaling effects. The substances used may be oxidising agents to strengthen the dough or reducing agents to develop gluten and reduce mixing time, emulsifiers to strengthen the dough or to provide other properties such as making slicing easier, or enzymes to increase gas production.

3.5 What is Bread Processing?

Traditionally, the term bread processing was used by high-speed bakers to assess the contribution of moulding or makeup stages of dough to the manufacture of bread. Today, it’s a broader term describing the overall manufacturing process of breads and buns. It consists of a series of steps including mixing, fermentation, makeup, proofing, baking, cooling, slicing and packaging. Due to their critical role, these processes must be carefully operated to meet pre-set conditions and specifications.

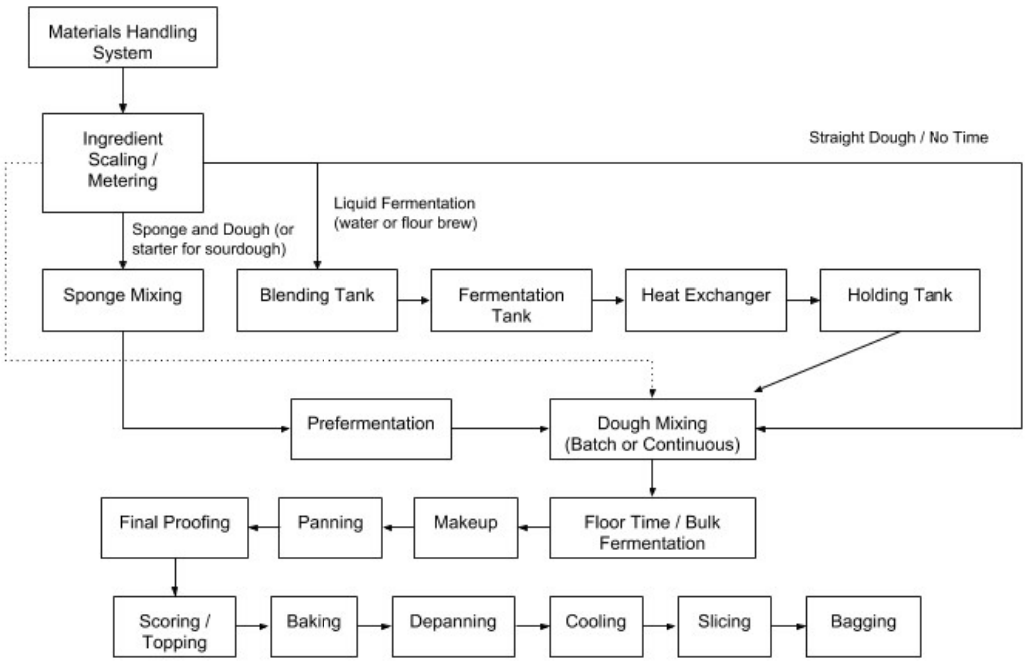

Fig. 1: Processing of Bread

3.5.1 Bread Processing/Bread Manufacture Process

Product Description

- Bread is one of the oldest and largest foodstuffs eaten and is consumed by all age groups all over the world.
- The basic dietary minerals, mainly magnesium, calcium, potassium, sodium, and iron, are also given by bread.
- Bread can be represented by a series of processes involving mixing, kneading, proofing, forming, baking as a fermented confectionery product that is produced primarily from wheat flour, yeast, water, sugar, salt and other necessary ingredients.
- Bread is a staple food prepared, usually by baking, from flour and water dough.
- To make good bread, dough created by any process must be sufficiently extensible to relax and expand while it rises.
- If it's going to stretch out when pulled, strong dough is extendable.
- Bread may be leavened by naturally occurring bacteria, chemicals, yeast developed industrially, or aeration at high pressure.

Applications

The style and type of bread dictates the dough system to use as well as the processing conditions during mixing, makeup and baking. A baker would not like to produce ciabatta with a close crumb

structure, or to produce a loaf of white pan bread with an open crumb structure and texture like a ciabatta.All steps in bread processing are important for a successful operation, but most bakers would agree that the three truly vital process steps are mixing, fermentation and baking. They are commonly described as the heart and cornerstone of breadmaking operation and can also determine the finished product characteristics, both internally and externally.

3.5.2 Mixing

The objective is the blending and hydration of dry ingredients, air incorporation and gluten development for optimum dough handling properties. Variables to monitor and control include mixing time, energy input, dough temperature:

- Mixing time: a function of flour strength, its protein, damaged starch and non-starch polysaccharides and bran particles content. Other factors include mixer speed, mixing arm design, dough size in relation to mixer capacity, adequacy of refrigeration system (dough temperature) and delayed sugar/fat/salt addition.
- Mixing equipment: vertical (planetary), spiral (open and closed for vacuum mixing), horizontal, continuous (open and closed).
- Process specifications: 9–15 minutes at high speed in horizontal mixers. Final dough temperature should be 76–82°F (25–28°C).

3.5.3 Fermentation

The objective is yeast growth, production of CO_2, ethanol and organic acids, development of flavors and aromas, and modification of dough handling properties. Variables to monitor and control include fermentation time, temperature, titratable acidity (TTA), pH, microbial count:

- Fermentation time: controlled by the temperature of dough, sponge, starter or pre-ferment, hydration level (free water), pH, osmotic pressure, yeast food (amino acids, minerals, fermentable sugars) and yeast level (or lactic acid bacteria count).
- Fermentation equipment: troughs in fermentation room, closed tanks, open tanks, benches.
- Process specifications: 1–20 hours (at room conditions), depending on dough system used. The temperature in fermentation rooms is typically set between 75–85°F (24–29°C) with a relative humidity (RH) of 60–80%.

3.6 Different Types of Breads

White bread

The most common variety of bread is white bread. It is made from wheat flour (extraction rate of 77%) and is made into many different sizes, shapes and textures. Ingredients such as other cereal or vegetable flours, seeds, herbs or a mixture of these can be added.

Whole Meal or Whole Wheat Bread

Made from whole meal flour (contains all the components of the grain -close to 100% extraction rate),it has become more popular with increasing knowledge of the health benefits of bran and wheat germ.

Mixed grain Bread

May be made from any combination of flours (e.g. wholemeal or white flour, rye meal or flour), grains (e.g. kibbled grains, wheat germ, whole grains or wheat and other cereals) and seeds (e.g. sesame seeds).

Kibbled wheat and cracked wheat bread

Contains or is rolled in kibbled (cracked) wheat grains.

Fibre-increased white breads

Made with the addition of bran or other fibre-containing material.

Rye Bread

Made from a combination of rye flour and wheat flour. Dark rye bread contains a higher proportion of rye flour and rye meal than light rye and is consequently denser, heavy and has a stronger flavor. Pumpernickel is heavy, dark bread made from rye flour, rye meal and kibbled or cracked rye grains.

Sourdough Bread

Sourdough bread has a slightly sour flavour and a denser texture than regular bread. Sourdough describes the raising agent used to make this type of bread. A starter, made from a mixture of flour and water, serves as a medium for growing either commercial yeast that is added to the mixture or the ever-present wild yeast that is captured by the mixture from the air we breathe. (Yoghurt is also sometimes added to provide yeast.) This mixture is allowed to sour through a fermentation process that produces a gas and an acid. It is then used as a starter to leaven other breads; the gas produced by the fermentation is trapped in the elastic gluten structure of the dough, causing it to rise, while the acid imparts the final product with a tartflavour.

Damper

Traditionally baked in the Australian bush, damper is a chemically leavened white,roundbread.

Lavash bread

A thin, flat bread made from white wheat flour, yeast, salt and water which is oven-baked on a heated metal plate.

Bagel

A Jewish bread where the dough (with yeast) is shaped into a ring and thrown into boiling water before baking. This gives the crust a chewy texture. It may be coated with poppy or sesame seeds and can be flavoured, e.g.raisin and cinnamon.

Middle Eastern flat, Pocket or Pita Bread

Flat, oval or round wheat bread made from flour, water, yeast and salt. The "pocket" in some breads is made by resting the flattened pieces of dough under dry conditions so that both sides become slightly drier than the center. During baking at high temperature, the steam produced inside the dough is trapped by the baked, drier outside layers. The pocket can also be stuffed with various fillings. The Turkish version of pita bread is pide.

Naan

Made in India, Pakistan and Afghanistan, naan is a wheat-flour bread leavened with a starter of the sourdough kind and cooked in a clay Tan door oven. The clay and the smoke in the tandoor combine to produce a characteristic flavor. The bread is flattish and has a crisp crust.

3.7 Chapatti (chapatti)

Sometimes called roti, chapatti is served throughout India, Pakistan and also Iran. They are made from finely milled wholewheat flour, called atta. The dough is rolled into thin rounds which are cooked in an iron pan or on a griddle. They are made every day in North India where they are used as a plate to hold other food, curved to scoop up food or used for dipping in soupsorsauces.

Paratha or Parata

An Indian flaky bread prepared by smearing the unleavened dough with ghee or oil and then folding the dough. This procedure is repeated three times. The dough is then rolled out and fried in oil or dry cooked on a griddle.

Chinese Steamed Bread

Eaten in most countries of east Asia, Chinese steamed breads are shaped like a ball and have either no filling, a sweet bean paste or a meat filling. Lao bing is a Chinese-style flat bread which is baked in a pan until both sidesaregoldenbrown.

Chinese Buns and Dumplings

Buns and dumplings are common in north and South-East Asia. Manju, the generic term for steamed Japanese buns, are either lightly baked or steamed buns prepared by steaming a fermented dough with a pork, curry or sweet bean paste filling. In northern China, mantou is a steamed leavened bread without a filling, eaten as a staple in place of rice. Yit bien or moon cake is a baked bun filled with

nuts and seeds popular amongst Chinesepopulations. Mantou or mantu describes the food category of dumplings in Asia. They resemble ravioli and are stuffed with meat and/or vegetables and beans.

Gluten-free Bread

Gluten-free bread is usually based on corn flour to which flour from gluten-free grains (such as rice and maize), potato or pulses is added. Gluten-free bread has a denser, more crumbly texture than traditional bread, since the presence of gluten is essential for the typical structure and texture.Bread Manufacturing Bread manufacturing profession is as old as starting of human civilization.It is oldest profession when every house having its own bakery. Now with mechanization and with new technology breads are manufactured in mass scales. World over we can find thousands of bakeries preparing Variety of breads.We label bread with various names like bread, loaf, roti, kaboosetc

Bun

Bun originated from the city of Hamburg in Germany. The history of buns goes back to the 18th CE. People ate it with meat, and it was popular with German workers. During the reign of Queen Elizabeth I, the government passed the law that bakers could only make hot cross buns on Easter and Christmas. It was illegal to sell spiced buns on any other day.

Many people confuse buns with bread. However, they are different. Bread is a loaf which yields many servings, whereas a bun is a single-serving baked product. The primary ingredients in the bun are flour, milk, yeast, and a small amount of sugar or butter. However, a sweet bun has more sugar and some nuts and fruits. In addition, the name, taste, size, and shapes vary in different regions. Some examples are dinner rolls, cinnamon buns, hot cross buns, croissants, kaiser rolls, pizza rolls, Italian panini buns, ciabatta buns, etc.

A bun is a type of bread roll, typically filled with savory fillings (for example hamburger). A bun may also refer to a sweet cake in certain parts of the world. Though they come in many shapes and sizes, buns are most commonly round, and are generally hand-sized or smaller.In the United Kingdom, the usage of the term differs greatly in different regions. In Southern England, a bun is a hand-sized sweet cake, while in Northern England, it is a small round of ordinary bread. In Ireland, a bun refers to a sweet cake, roughly analogous to an American cupcake.

Buns are yeast-leavened bread products that are highly accepted globally for their soft texture, good taste and versatile utility. Therefore, buns are one of the most highly consumed food products. With their growing popularity, many types of buns are available in the market. However, the primary ingredients remain the same with little changes in the added ingredients with slight variation in the

taste. Traditionally, buns are usually round and small, but today, they are available in many shapes and sizes.

Buns are usually made from a dough of flour, milk, yeast and small amounts of sugar and/or butter. Sweet bun dough is distinguished from bread dough by the addition of sugar, butter and sometimes egg. Common sweet varieties contain small fruit or nuts, topped with icing or caramel, and filled with jam or cream.Chinese baozi, with savory or sweet fillings, are often referred to as buns in English.A bun is a type of bread roll or small cake that can be sweet or savory, and comes in many different shapes and sizes:

Sweet buns

Made with flour, sugar, butter, yeast, and eggs, buns can be flavored with spices or dried fruits. Some examples of sweet buns include Bath buns, Chelsea buns, currant buns, and saffron buns.

Savory buns

Buns can be filled with savory fillings, such as for a hamburger.

Other types of buns

Mangalore buns are soft and fluffy puris made with all-purpose flour and banana, and are usually served with coconut chutney and sambar.

Buns in other cultures

In Britain, hot cross buns are a sweet bread with spices that are traditionally eaten at the end of Lent. In Sri Lanka, kibulabanis are sugar buns.

Nutritional Properties of Buns

As per USDA, 100g of bun serving contains the following nutrients:

- Energy: 256 kcal
- Protein: 9.3g
- Carbohydrate: 48.84
- Fat: 3.49g
- Fibre: 2.3g
- Sugar: 6.98g
- Sodium: 465mg

3.8 Pastries

Pastry refers to a variety of doughs (often enriched with fat or eggs), as well as the sweet and savoury baked goods made from them. These goods are often called pastries as a synecdoche, and the dough may be accordingly called pastry dough for clarity. Sweetened pastries are often described as *bakers' confectionery*. Common pastry dishes include pies, tarts, quiches, croissants, and pasties.The French word pâtisserie is also used in English (with or without the accent) for many of the same foods, as well as the set of techniques used to make them. Originally, the French word *pastisserie* referred to anything, such as a meat pie, made in dough (*paste*, later *pâte*) and not typically a luxurious or sweet product. This meaning still persisted in the nineteenth century, though by then the term more often referred to the sweet and often ornate confections implied today.

Definitions

The precise definition of the term pastry varies based on location and culture. Common doughs used to make pastries include filo dough, puff pastry, choux pastry, short dough, *pâte brisée*, *pâte sucrée*, and other enriched doughs. Pastries tend to have a delicate texture, often flaky or crumbly, and rich flavor, simple breads are thus excluded from the pastry category. Pastries also tend to be baked.

Pastry Bag or Piping Bag

A disposable or reusable bag that is often cone-shaped, used to make an even stream of dough, frosting, or flavored substance to form a structure, decorate a baked item, or fill a pastry with a custard, cream, jelly, or other filling.

Pastry board

A square or oblong board, preferably marble but usually wood, on which pastry is flattened.

Pastry board

Opposed and counter-rotating rollers with a variable gap through which pastry can be worked and reduced in thickness for commercial production. A small version is used domestically for pasta production.

Pastry case

An uncooked or blind baked pastry container that is used to hold savory or sweet mixtures.

Pastry cream

Confectioner's custard. An egg- and flour-thickened custard made with sweetened milk flavored with vanilla. It is traditionally used as a filling for flans, cakes, pastries, tarts, etc. The flour prevents the egg from curdling.

Pastry cutters

Various metal or plastic outlines of shapes, *e.g.* circles, fluted circles, diamonds, gingerbread men, etc., sharpened on one or both sides and used to cut out corresponding shapes from biscuit, scone, pastry, or cake mixtures.

Pastry blender

A kitchen implement used to chop the fat into the flour, which prevents the melting of the fat with body heat from fingers, and improves control of the size of the fat chunks. Usually constructed of wire or plastic, with multiple wires or small blades connected to a handle.

Viennoiserie

French term for Viennese pastry, which, although it technically should be yeast raised, is now commonly used as a term for many laminated and puff- and choux-based pastries, including *croissants*, *brioche*, and *pain au chocolat.*

History

The European tradition of pastry-making is often traced back to the shortcrust era of flaky doughs that were in use throughout the Mediterranean in ancient times. In the ancient Mediterranean, the Romans, Greeks, and Phoenicians all had filo-style pastries in their culinary traditions. In the plays of Aristophanes, written in the 5th century BC, there is mention of sweetmeats, including small pastries filled with fruit. Roman cuisine used flour, oil, and water to make pastries that were used to cover meats and fowls during baking in order to keep in the juices, but the pastry was not meant to be eaten. A pastry that was meant to be eaten was a richer pastry that was made into small pastries containing eggs or little birds and that were often served at banquets. Greeks and Romans both struggled in making a good pastry because they used oil in the cooking process, and oil causes the pastry to lose its stiffness.

In the medieval cuisine of Northern Europe, pastry chefs were able to produce nice, stiff pastries because they cooked with shortening and butter. Some incomplete lists of ingredients have been found in medieval cookbooks, but no full, detailed versions. There were stiff, empty pastries called coffins or 'huff paste', that were eaten by servants only and included an egg yolk glaze to help make them more enjoyable to consume. Medieval pastries also included small tarts to add richness.

It was not until about the mid-16th century that actual pastry recipes began appearing. These recipes were adopted and adapted over time in various European countries, resulting in the myriad pastry traditions known to the region, from Portuguese pastéis de nata in the west to Russian pirozhki in the

east. The use of chocolate in pastry-making in the west, so commonplace today, arose only after Spanish and Portuguese traders brought chocolate to Europe from the New World starting in the 16th century. Many culinary historians consider French pastry chef Antonin Carême (1784–1833) to have been the first great master of pastry making in modern times.

Pastry-making has a strong tradition in many parts of Asia. Chinese pastry is made from rice, or different types of flour, with fruit, sweet bean paste or sesame-based fillings. The mooncakes are part of Chinese MidAutumn Festival traditions, while cha siu bao, steamed or baked pork buns, are a regular savory dim sum menu item. In the 19th century, the British brought western-style pastry to the Far East, though it would be the French-influenced Maxim in the 1950s that made western pastry popular in Chinese-speaking regions starting with Hong Kong. The term western cake is used to refer to western pastry, otherwise Chinese pastry is assumed. Other Asian countries such as Korea prepare traditional pastry-confections such as tteok, hangwa, and yaksik with flour, rice, fruits, and regional specific ingredients to make unique desserts. Japan also has specialized pastry-confections better known as mochi and manjū. Pastry-confections that originate in Asia are clearly distinct from those that originate in the west, which are generally much sweeter.

3.9 Types

Shortcrust pastry

Shortcrust pastry is the simplest and most common pastry. It is made with flour, fat, butter, salt, and water to bind the dough. *Pâte brisée* is the French version of classic pie or tart shortcrust pastry. The process of making pastry includes mixing of the fat and flour, adding water, chilling and then rolling out the dough. Chilling before rolling is essential since it enables the fat (lard, butter, etc.) to harden again and thus create flaky layers in the dough. It also allows for even hydration and inhibits gluten formation. It results in a tender flaky pastry.The fat is mixed with the flour first, generally by rubbing with fingers or a pastry blender, which inhibits gluten formation by coating the gluten strands in fat and results in a short (as in crumbly; hence the term shortcrust), tender pastry. A related type is the sweetened sweetcrust pastry, also known as *pâte sucrée*, in which sugar and egg yolks have been added (rather than water) to bind the pastry.

Flaky pastry

Flaky pastry is a simple pastry that expands when cooked due to the number of layers. It bakes into a crisp, buttery pastry. The "puff" is obtained by the shard-like layers of fat, most often butter or shortening, creating layers which expand in the heat of the oven when baked.Puff pastry has many layers that cause it to expand or puff when baked. Puff pastry is made using a laminated

dough consisting of flour, butter, salt, and water. The pastry rises up due to the water and fats expanding as they turn into steam upon heating. Puff pastry come out of the oven light, flaky, and tender.

Choux pastry

Choux pastry is a very light pastry that is often filled with cream. Unlike other types of pastry, choux is in fact closer to a dough before being cooked which gives it the ability to be piped into various shapes such as the éclair and profiterole. Its name originates from the French *choux*, meaning cabbage, owing to its rough cabbage-like shape after cooking.Choux begins as a mixture of milk or water and butter which are heated together until the butter melts, to which flour is added to form a dough. Eggs are then beaten into the dough to further enrich it. This high percentage of water causes the pastry to expand into a light, hollow pastry. Initially, the water in the dough turns to steam in the oven and causes the pastry to rise; then the starch in the flour gelatinizes, thereby solidifying the pastry. Once the choux dough has expanded, it is taken out of the oven; a hole is made in it to let out the steam. The pastry is then placed back in the oven to dry out and become crisp. The pastry is filled with various flavors of cream and is often topped with chocolate. Choux pastries can also be filled with ingredients such as cheese, tuna, or chicken to be used as appetizers.

3.10 Cakes

During the Great Depression, there was a surplus of molasses and the need to provide easily made food to millions of economically depressed people in the United States. One company patented a cake-bread mix to deal with this economic situation and thereby established the first line of cake in a box. In doing so, cake, as it is known today, became a mass-produced good rather than a home- or bakery-made specialty.

Later, during the post-war boom, other American companies (notably General Mills) developed this idea further, marketing cake mix on the principle of convenience, especially to housewives. When sales dropped heavily in the 1950s, marketers discovered that baking cakes, once a task at which housewives could exercise skill and creativity, had become dispiriting. This was a period in American ideological history when women, retired from the war-time labor force, were confined to the domestic sphere while still exposed to the blossoming consumerism in the US. This inspired psychologist Ernest Dichter to find a solution to the cake mix problem in the frosting. Since making the cake was so simple, housewives and other in-home cake makers could expend their creative energy on cake decorating inspired by, among other things, photographs in magazines of elaborately decorated

cakes.Ever since boxed cake mix has become a staple of supermarkets, it is often complemented with frosting in a can.

Varieties

Cakes are broadly divided into several categories, based primarily on ingredients and mixing techniques. There are about *hundreds* of different types of cakes, but there are two broad categories, that culinary divide them into: *shortened,* and *unshorted cakes*. Unshortened cakes contain no fat while *shortened cakes* do. These types may be combined in baking.Although clear examples of the difference between cake and bread are easy to find, the precise classification has always been elusive.

Butter cake

Fig. 2: Gooey butter cake

Butter cakes are made from creamed butter, sugar, eggs, and flour. They rely on the combination of butter and sugar beaten for an extended time to incorporate air into the batter. A classic pound cake is made with a pound each of butter, sugar, eggs, and flour. Another type of butter cake that takes its name from the proportion of ingredients used is 1-2-3-4 cake: 1 cup butter, 2 cups sugar, 3 cups flour, and 4 eggs. According to Beth Tartan, this cake was one of the most common among the American pioneers who settled North Carolina.Baking powder is in many butter cakes, such as Victoria sponge. The ingredients are sometimes mixed without creaming the butter, using recipes for simple and quick cakes.

Sponge cake

Fig. 3: Steamed sponge cake called *ma laigao*

Sponge cakes (or foam cakes) are made from whipped eggs, sugar, and flour. Traditional sponge cakes are leavened only with eggs. They rely primarily on trapped air in a protein matrix (generally beaten eggs) to provide leavening, sometimes with a bit of baking powder or other chemical leaven added. Egg-leavened sponge cakes are thought to be the oldest cakes made without yeast.Angel food cake is a white cake that uses only the whites of the eggs and is traditionally baked in a tube pan. The French Génoise is a sponge cake that includes clarified butter. Highly decorated sponge cakes with lavish toppings are sometimes called *gateau*, the French word for cake. Chiffon cakes are sponge cakes with vegetable oil, which adds moistness.

Chocolate cake

Fig. 4: German chocolate cake

Chocolate cakes are butter cakes, sponge cakes, or other cakes flavored with melted chocolate or cocoa powder. German chocolate cake is a variety of chocolate cake.

Coffee cake

Coffee cake is generally thought of as a cake to serve with coffee or tea at breakfast or a coffee break. Some types use yeast as a leavening agent, while others use baking soda or baking powder. These cakes often have a crumb topping called streusel or a light glaze drizzle.

Flourless cake

Baked flourless cakes include clementine cakes, baked cheesecakes, and flourless chocolate cakes.

Layer cakes

Layer cakes are cakes made with layers of sponge or butter cake filled with cream, jam, or other filling to hold the layers together.

One-egg cake

One-egg cakes are made with one egg. They can be made with butter or vegetable shortening. One egg cake was an economical recipe when using two eggs for each cake was too costly.Cake is a flour confection made from flour, sugar, and other ingredients and is usually baked. In their oldest forms, cakes were modifications of bread, but cakes now cover a wide range of preparations that can be simple or elaborate and which share features with desserts such as pastries, meringues, custards, and pies.

The most common ingredients include flour, sugar, eggs, fat (such as butter, oil, or margarine), a liquid, and a leavening agent, such as baking soda or baking powder. Common additional ingredients include dried, candied, or fresh fruit, nuts, cocoa, and extracts such as vanilla, with numerous substitutions for the primary ingredients. Cakes can also be filled with fruit preserves, nuts, or dessert sauces (like custard, jelly, cooked fruit, whipped cream, or syrups),iced with buttercream or other icings, and decorated with marzipan, piped borders, or candied fruit.

Cake is often served as a celebratory dish on ceremonial occasions, such as weddings, anniversaries, and birthdays. There are countless cake recipes; some are bread-like, some are rich and elaborate, and many are centuries old. Cake making is no longer a complicated procedure; while at one time considerable labor went into cake making (particularly the whisking of egg foams), baking equipment and directions have been simplified so that even the most amateur of cooks may bake a cake.

Preparation/Baking a cake

Baking a cake at home can be a delightful and rewarding experience. The aroma of freshly baked cake filling the kitchen, the anticipation of that first delectable bite - it's a treat for all the senses. Whether you're a beginner or an experienced baker, following a set of steps can help you achieve a moist and delicious cake every time. In this article, we'll explore the ten essential steps to baking a cake at home, ensuring success and satisfaction.

Step 1: Gather Your Ingredients

Before you start mixing and measuring, it's crucial to gather all the necessary ingredients. You'll typically need flour, sugar, eggs, butter, baking powder, milk, and vanilla extract. Additionally, check if the recipe calls for any specific ingredients like cocoa powder, nuts, or fruits. Having everything prepared and within reach will make the baking process smooth and efficient.

Step 2: Prepare the Cake Pans

Preheat your oven to the required temperature as mentioned in the recipe. While the oven is heating up, prepare your cake pans by greasing them with butter or cooking spray. Dust the pans with flour, tapping out any excess. This ensures that the cake will come out easily once baked.

Step 3: Measure and Sift Dry Ingredients

In a large mixing bowl, measure the required amount of flour, sugar, baking powder, and any other dry ingredients stated in your recipe. To avoid lumps and achieve a lighter texture, sift these dry ingredients together. This process helps incorporate air and ensures even distribution.

Step 4: Combine Wet Ingredients

In a separate bowl, whisk together the wet ingredients, such as eggs, milk, melted butter, and vanilla extract. Beat the mixture until well combined and smooth. The wet ingredients will bind the cake batter and provide moisture.

Step 5: Gradually Add Dry Ingredients

Now it's time to combine the wet and dry ingredients. Gradually pour the dry ingredients into the bowl with the wet ingredients, using a spatula or electric mixer on low speed. Mix until the batter is smooth and all the ingredients are fully incorporated. Be careful not to overmix, as this can lead to a dense cake.

Step 6: Pour Batter into Cake Pans

Divide the cake batter equally between the prepared pans. Use a spatula to spread the batter evenly and smooth the surface. Tap the pans gently on the countertop to release any trapped air bubbles.

Step 7: Bake in Preheated Oven

Place the cake pans in the preheated oven, ensuring there is enough space between them for proper air circulation. Bake according to the recommended time in your recipe. Avoid opening the oven door frequently, as this can cause temperature fluctuations. Your cake is ready when it turns golden brown and a toothpick inserted into the center comes out clean.

Step 8: Cool and Remove from Pans

Once the cakes are baked, remove them from the oven and let them cool in the pans for about 10 minutes. Then, carefully transfer the cakes to a wire rack to cool completely. This cooling process allows the cake to set and makes it easier to frost or decorate later.

Step 9: Frost and Decorate

After the cakes have cooled, it's time to get creative with frosting and decorations. Choose your favorite frosting recipe or create your own. Spread a generous layer of frosting between the cake layers and over the top and sides of the cake. You can also add decorations like sprinkles, fruits, or chocolate shavings to enhance the presentation.

Step 10: Enjoy Your Homemade Cake!

Finally, the moment you've been waiting for - it's time to indulge in your homemade cake! Cut a slice, savor the flavors, and share the joy with your family.

1. Gather Your Ingredients

What Ingredients You May Need

For a traditional Victoria Sponge Cake, one of the most beloved cakes in the UK, you'll need:

- **Flour**: Self-raising flour for a light texture.

- **Sugar**: Caster sugar, which dissolves easily.
- **Eggs**: Large, free-range eggs for richness.
- **Butter**: Unsalted, to control the salt level.
- **Baking Powder**: For additional leavening.
- **Milk**: Whole milk for moisture.
- **Vanilla Extract**: Pure vanilla for flavor.
- **Strawberry Jam**: A classic filling.
- **Double Cream**: For whipping and filling.
- **Icing Sugar**: For dusting the top.

Quantities Needed

Single-Tier Cake:

- Flour: 200g
- Sugar: 200g
- Eggs: 4 large
- Butter: 200g
- Baking Powder: 1 tsp
- Milk: 2 tbsp
- Vanilla Extract: 1 tsp
- Strawberry Jam: 100g
- Double Cream: 150ml
- Icing Sugar: 1 tbsp

Two-Tier Cake:

- Flour: 400g
- Sugar: 400g
- Eggs: 8 large
- Butter: 400g
- Baking Powder: 2 tsp
- Milk: 4 tbsp
- Vanilla Extract: 2 tsp
- Strawberry Jam: 200g
- Double Cream: 300ml
- Icing Sugar: 2 tbsp

Three-Tier Cake:

- Flour: 600g
- Sugar: 600g
- Eggs: 12 large
- Butter: 600g
- Baking Powder: 3 tsp
- Milk: 6 tbsp
- Vanilla Extract: 3 tsp
- Strawberry Jam: 300g
- Double Cream: 450ml
- Icing Sugar: 3 tbsp

Cost Estimates

Single-Tier Cake:

- Flour: £0.50
- Sugar: £0.40
- Eggs: £1.20
- Butter: £1.50
- Baking Powder: £0.10
- Milk: £0.20
- Vanilla Extract: £0.60
- Strawberry Jam: £0.70
- Double Cream: £0.80
- Icing Sugar: £0.10

Total Cost: Approximately £6.10

Where to Buy Ingredients in London

- **Flour & Sugar**: Available at Tesco, Sainsbury's, or ASDA.
- **Eggs & Butter**: Found in major supermarkets like Waitrose or online via Ocado.
- **Vanilla Extract & Baking Powder**: Specialty stores like Lakeland or high street supermarkets.
- **Strawberry Jam & Double Cream**: Purchase at Marks & Spencer or other local grocery stores.

How to Use These Ingredients

- **Butter**: Ensure it's softened at room temperature for easy mixing.
- **Flour**: Sift to remove lumps and ensure a smooth batter.
- **Eggs**: Beat individually before adding to the mix to ensure uniformity.
- **Milk**: Gradually mix in to reach the desired batter consistency.
- **Vanilla Extract**: Add at the end of mixing for the best aroma.
- **Strawberry Jam**: Spread evenly between layers for a balanced taste.
- **Double Cream**: Whip until soft peaks form, then layer between the cakes.

2. Prepare the Cake Pans

Why It's Important

Properly prepared cake pans ensure even baking and easy removal of the cake.

Types of Cake Pans

- **Round Pans**: For traditional cakes.
- **Square Pans**: Ideal for layer cakes.
- **Bundt Pans**: For decorative shapes.

Preparation Steps

1. **Grease the Pans**: Use a pastry brush to apply butter evenly across the surface.
2. **Dust with Flour**: Lightly coat with flour, then tap out excess to prevent sticking.
3. **Line with Parchment Paper**: Cut to fit the base, ensuring easy removal.

Practical Tips

- Use a non-stick spray for a more straightforward release.
- Consider silicone molds for intricate designs, as they require less greasing.

3. Measure and Sift Dry Ingredients

Why It's Essential

Accurate measurement ensures the right balance of ingredients, while sifting prevents lumps and incorporates air, leading to a lighter cake.

Equipment Needed

- **Measuring Cups and Spoons**: For precision.
- **Digital Scale**: For accuracy in weight measurements.
- **Sifter or Fine Mesh Strainer**: To aerate the flour and other dry ingredients.

Step-by-Step Process

1. **Measure Ingredients Precisely**: Use a digital scale for flour and sugar.

2. **Sift Together**: Combine flour, baking powder, and any other dry ingredients, then sift into a large bowl.
3. **Mix Thoroughly**: Use a whisk to ensure even distribution of baking powder within the flour.

Practical Example

For a **Lemon Drizzle Cake**, you'll need:

- **Flour**: 225g self-raising flour.
- **Sugar**: 225g caster sugar.
- **Baking Powder**: 1.5 tsp.

Sift and mix these ingredients to avoid clumps and ensure a smooth batter.

4. Combine Wet Ingredients

Why It's Important

The wet ingredients provide moisture and help bind the cake together, ensuring a tender crumb.

Common Wet Ingredients

- **Eggs**: Often beaten to incorporate air.
- **Milk or Buttermilk**: Adds moisture.
- **Melted Butter or Oil**: For richness.
- **Vanilla Extract**: Adds flavor depth.

Mixing Method

1. **Whisk Eggs**: Beat until light and frothy.
2. **Add Liquids**: Incorporate milk and melted butter gradually.
3. **Mix for Smoothness**: Ensure no lumps remain.

3.11 What is fibre?

Fibre is a nutrient that is needed by your body to keep you healthy. It’s digested by the bacteria in your gut to produce substances that keep you healthy. Eating a diet high in fibre and wholegrain foods is linked to a lower risk of:obesity

- type 2 diabetes
- heart disease
- lower cholesterol
- bowel cancer
- diverticular disease

- constipation
- haemorrhoids

Because high-fibre foods help fill you up, they tend to make you eat less and help you keep a healthy weight.Foods high in fibre help to keep your digestive system healthy. They are also good sources of vitamins and minerals, and other important nutrients.

What Foods contain Fibre?

There are several types of fibre including:

- soluble fibre
- insoluble fibre
- resistant starch

Because they have different health benefits, it's important to include these in your diet.

Soluble Fibre

Soluble fibre is a type of fibre that dissolves in water. It's found in foods such as:

- oats
- legumes (split peas, dried beans such as red kidney beans, baked beans and lentils)
- fruit
- vegetables
- seeds and nuts
- breads, cereals and pasta

Foods high in this type of fibre can help you feel full. They also help reduce constipation by speeding up the time it takes for faeces (poo) to pass through your body.Some soluble fibre can reduce the amount of cholesterol absorbed from your small intestine. This can be found in:

- fruit
- oats
- barley
- psyllium

Soluble fibre can also help to lower your blood cholesterol levels when eaten as part of a diet that is also low in saturated fat.Soluble fibre can also help to stabilise your blood glucose level if you have diabetes.

Insoluble Fibre

Insoluble fibre is a type of fibre that doesn't dissolve in water. It's found in:

- high-fibre and whole grain breads and cereals
- the outer skins of fruit and vegetables
- nuts and seeds

Because insoluble fibre absorbs water, it helps to soften the contents of your bowel, and keep your bowel movements (poos) regular. This helps to prevent constipation.

Resistant Starch

Resistant starch is another type of carbohydrate that isn't easily absorbed. Different ways of cooking can create different amounts of resistant starch. For example, resistant starch is found in:

- slightly undercooked ('al dente') pasta
- cooked but cooled potatoes (including potato salad) pasta and rice
- under-ripe bananas
- beans
- lentils

In general, foods that are less highly processed contain more resistant starch.An important benefit of resistant starch is that it ferments. Fermenting produces substances that help to keep the lining of your bowel healthy.

How much Fibre do I need?

In Australia, the recommended daily intake of dietary fibre is:

- 25g for women
- 30g for men

Most Australians eat less than this.It's important to include different types of fibre in your diet, from a variety of plant foods. To get enough fibre every day, Cancer Council Australia recommends that you should eat:

- a variety of wholegrain or wholemeal foods
- at least 2 serves of fruit daily
- at least 5 serves of vegetables daily including legumes (also known as 'pulses')

The Australian Dietary Guidelines provide the following guidelines for servings each day:

- children aged 2 to 18 years should have 4 — 7 serves of wholegrain foods

- pregnant people should have 8 — 9 serves of wholegrain foods
- adults aged 19 to 50 years should have 6 serves of wholegrain foods
- males aged over 51 years should have 4.5 — 6 serves of wholegrain foods
- females aged over 51 years should have 3 — 4 serves of wholegrain foods

It may seem difficult to get enough serves of wholegrain foods every day. Try to eat wholegrain or wholemeal varieties for half of your daily serves of bread and cereals. A serve of wholegrain or wholemeal foods is equal to:

- 1 slice of wholegrain bread or 1/2 a medium wholemeal bread roll
- 1/2 a cup of cooked brown rice, pasta, noodles, or cooked porridge
- 2/3 cups of wholegrain breakfast cereal
- 1/4 cup of untoasted muesli

The combination of nutrients in food work together to produce health benefits. So, it's better to have wholefoods, rather than dietary fibre supplements.

Tips for including more Fibre in your diet

- Enjoy wholegrain, wholemeal or mixed grain toast instead of white varieties.
- Use wholemeal pasta instead of white pasta.
- Try brown rice or quinoa instead of white rice with casseroles or curries.
- Use wholemeal flour to thicken sauces, gravies and stews.
- Try wholegrain, seeded or wholemeal crisp breads with vegetable-based dips.
- Know which packaged foods are high in fibre by reading the nutrient panel on the pack.

Dietary fibre absorbs fluid so it's important to drink enough liquid, including water.

3.11 Summary

Under this unit, we have summarized about bread preparation & formulation, its types with manufacturing processes, fermentation, pastries and chapatti etc. One of the advantages of bakery products is its amenability to produce varieties with different taste and texture. Hence, several varieties of breads are produced world over. These varieties are produced either by (i) Adding newer ingredients (ii) Changing the processing conditions (iii) Varying shape and size (iv) Altering the ingredient level etc. The varieties available in India are very few. Hence, there is a great scope of diversity, by producing different varieties, keeping in view the palate of the Indian consumer.

This would help the industry to grow, on the right path. Some of the varieties of breads that could be produced in the country are whole wheat bread, brown bread, fruit bread, milk bread, composite flour

bread, therapeutic breads etc. Whole wheat bread is produced using whole wheat flour (atta). The bread is not only nutritious but also has typical wheat aroma. Whole wheat flour requires more water to prepare the dough in view of higher water absorption capacity of bran. In the preparation of whole wheat bread lesser fermentation time of 45-60 min and additives like potassium bromate or ascorbic acid, sodium stearoyl-2-lactylate, fungal alpha amylase and dry gluten are required.

Brown bread is normally made by mixing wheat flour (maida) and whole wheat flour (atta) in the ratio of 50:50. The processing conditions and additives used are the same as whole wheat bread. The volume of brown bread is generally better than whole wheat bread. Incorporation of malt extract or brown sugar improves colour and flavour of bread. Fruit bread is made by sponge and dough method and about 20% of fruits are added in the dough stage. The formulation isthe same as sweet bread. Milk bread is prepared using sweet bread formulation and should contain atleast 6.0 milk solids. Generally 6.0% skimmed milk powder is added. Addition of milk improves the nutritional quality ofbread.

3.12 Terminal questions

Q. 1 What do you mean by bread processing**?** Explain it.

Answer:----------

Q. 2 Describe bread, preparation & formulation.

Answer:----------

Q. 3 Describe different types of breads.

Answer:----------

Q. 4 Write short notes on the following.

(a) Cakes

(b) Pastries

Answer:----------

Q. 5 Write a short note on fermentation.

Answer:----------

Q. 6 Write a short note on chapatti and its types.

Answer:----------

Further readings

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

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मुक्त विश्वविद्यालय, प्रयागराज

HNSEC-06

Bakery And Quantity Cookery

Block-2
Preparation and quality evaluation of Biscuits, Cookies Macroons, Muffins Home Made Choclates and Pies

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BLOCK 2

This is the second block (Preparation and Quality Evaluation of Biscuits and Menu Planning and Food Facilities)onBakery And Quantity Cookery.The second block is further organized into next three units as under:

Unit 4: Preparation and quality evaluation of Biscuits, Cookies, Macroons, Muffins, Home made Chocolates and Pies.

Unit 5: Menu planning and Food Facilities

Unit 6: Production Planning and Quantity Food Production

The introduction of second block is as under:

Block Introduction

Nutrition**,** the assimilation by living organisms of food materials that enable them to grow, maintain themselves, and reproduce. Food serves multiple functions in most living organisms. For example, it provides materials that are metabolized to supply the energy required for the absorption and translocation of nutrients, for the synthesis of cell materials, for movement and locomotion, for excretion of waste products, and for all other activities of the organism. Diet therapy is a broad term for the alteration or adoption of a diet to prevent or treat a disease or to simply promote optimum health. In some cases, an alternative dietary lifestyle plan may be developed to eliminate certain foods to reclaim health. An incorrect diet can cause not only weight gain and skin conditions but may promote exhaustion and fatigue.

The importance of nutritional management is advocated in the field of clinical medicine. Since many probiotics are applied as foods, establishment of standards for expression of their function in foods may also be important. From the viewpoint that nutritional management of patients has a significant influence on recovery from diseases and on prognosis, formation of a nutrition support team (NST) by hospital staff such as physicians, nurses, pharmacists, and administrative dietitians for nutritional management of patients from a comprehensive viewpoint has been introduced. It is expected that application of probiotics will spread widely as a part of nutritional management of patients in all fields.

Nutritional management of the burn patient is an important facet of overall management. It is important to involve a multidisciplinary feeding team to manage nutrient intake and organize nutritional assessment. A warm and ambient temperature is essential for reducing fluid and heat loss and keeping the patient comfortable.

Unit- 4: Preparation of Quality Evaluation of Biscuits, Cookies Macroons, Muffins, Home madeChoclates and Pies

Structure

Objectives

4.1 Introduction

4.2 Cookies

4.3 Macaroons

4.4 Biscuit

4.5 Muffins

4.6 Sugar Cookery

4.7 Cocoa Processing

4.8 Chocolate Products

4.9 Fermentation

4.10 Candy

4.11 Toffee

4.12 Pies

4.13 Fudge

4.14 Fondant

4.15 Marshmallow

4.16 Chewing gum

4.17 Jelly

4.18 Confectionery

4.19 Summary

4.20 Terminal questions

Further readings

4.1 Introduction

Bakery products are one of the most profitable segments in supermarket retailing. The use of frozen dough by retail bakers has advantages and is more convenient. Control over biscuit weight, biscuit dimensions (thickness and to a lesser extent diameter) and biscuit moisture content is vital for the manufacturer. Large variability in biscuit weight and thickness will cause production breakdown problems at the closely tolerance packaging stations and can also result in excessive underweight and overweight packets that violate packaging legislation. Cookies have been suggested as a good way to use composite flours as they are ready-to-eat, provide a good source of energy, and are consumed widely throughout the world.

The term cookies, or biscuits as they are called in many parts of the world, refers to a baked product generally containing the three major ingredients flour, sugar and fat. These are mixed together with other minor ingredients to form dough. In the USA, the cookie and cracker manufacturing industry includes about 300 companies with combined annual revenue of about $11 billion19. Biscuits are convenient food products, becoming very popular among both rural and urban populations of worldwide. Some of the reasons for such wide popularity are low cost among other processed foods, varied taste, easy availability and longer shelf life.

Objectives

This is the fourth unit **(**Preparation of Quality Evaluation of Biscuits, Cookies Macroons, Muffins, Home madeChoclates and Pies**)** of second block (Preparation and Quality Evaluation of Biscuits and Menu Planning and Food Facilities). After studying this unit, you will be able to:

- To introduce cookies, Macroons and biscuits
- To know about cocoa processing, chocolate products and fermentation.
- To discuss about candy, toffee, pies, fudge and fondant
- To know about muffins, marshmallow, Chewing gum, jelly and sugar cookery

4.2 Cookies

A biscuit, (American English) or biscuit (British English) is a baked snack or dessert that is typically small, flat, and sweet. It usually contains flour, sugar, egg, and some type of oil, fat, or butter. It may include other ingredients such as raisins, oats, chocolate chips, or nuts. Most English-speaking countries call crunchy cookies "biscuits", except for the United States and Canada, where biscuit refers to a type of quick bread. Chewier biscuits are sometimes called "cookies," even in the Commonwealth. Some cookies may also be named by their shape, such as date squares or bars. Biscuit

or cookie variants include sandwich biscuits, such as custard creams, Jammie Dodgers, Bourbons, and Oreos, with marshmallows or jam filling and sometimes dipped in chocolate or another sweet coating. Cookies are often served with beverages such as milk, coffee, or tea and sometimes dunked, an approach which releases more flavour from confections by dissolving the sugars, while also softening their texture. Factory-made cookies are sold in grocery stores, convenience stores, and vending machines. Fresh-baked cookies are sold at bakeries and coffeehouses.

Cookies are most commonly baked until crisp or else for just long enough to ensure a soft interior. Other types of cookies are not baked at all, such as varieties of peanut butter cookies that use solidified chocolate rather than set eggs and wheat gluten as a binder. Cookies are produced in a wide variety of styles, using an array of ingredients including sugars, spices, chocolate, butter, peanut butter, nuts, or dried fruits.

A general theory of cookies may be formulated in the following way. Despite its descent from cakes and other sweetened breads, the cookie in almost all its forms has abandoned water as a medium for cohesion. Water in cakes serves to make the batter as thin as possible, the better to allow bubbles—responsible for a cake's fluffiness—to form. In the cookie the agent of cohesion has become some form of oil. Oils, whether in the form of butter, vegetable oils, or lard, are much more viscous than water and evaporate freely at a far higher temperature. Thus a cake made with butter or eggs in place of water is much denser after removal from the oven.

Fig. 1: Cookies baking in an oven

Rather than evaporating as water does in a baking cake, oils in cookies remain. These oils saturate the cavities created during baking by bubbles of escaping gases. These gases are primarily composed of steam vaporized from the egg whites and the carbon dioxide released by heating the baking powder.

This saturation produces the most texturally attractive feature of the cookie, and indeed all fried foods: crispness saturated with moisture (namely oil) that does not render soggy the food it has soaked into.

4.3 Macaroons

A macaroon is a small cake or cookie, originally made from ground almonds, egg whites, and sugar, but now often with coconut or other nuts. They may also include jam, chocolate, or other flavorings.

Etymology

The name *macaroon* is borrowed from French *macaron*, in turn from the Sicilian *maccarone,* a variant form of *maccherone*, the same word as macaroni. The origin of that is unclear; it may be from medieval Greek μακαρία, 'barley broth', or 'funeral chant'. The etymology connecting it to Italian *maccare*, 'to bruise' is now rejected. The origin of the word may also have referred to a sort of gnocchi.

Origins

Macaroons can be traced to a French monastery of the 8th century in the city of Cormery. Later, two Benedictine nuns, Sister Marguerite and Sister Marie-Elisabeth, came to Nancy, France seeking asylum during the French Revolution. The two women paid for their housing by baking and selling macaroons, and thus became known as the Macaroon Sisters. Macaroons became a popular treat for Jews on Passover because they had no flour or leavening as macaroons are leavened by egg whites. Recipes for macaroons appeared in recipe books at least as early as 1725 (Robert Smith's *Court Cookery, or the Complete English Cook*), and use egg whites and almond paste. *Mrs Beeton's Book of Household Management* (1861) includes a typical traditional recipe. Over time, coconut was added to the ground almonds and, in certain recipes, replaced them. Potato starch is also sometimes included in the recipe, to give the macaroons more body.

Nutrition

Mass-produced commercial macaroons are generally about half an ounce, or 14 grams, in weight. They do not undergo a high amount of food processing, containing only coconut, sweetener, starch, egg whites and flavoring, if any. At about 60–70 calories each, however, they contain about 3–4 grams of saturated fat due to the coconut, and 3–4 grams of added sugar, depending on the particular flavor. They are Ovo-vegetarian (not Lactarian or vegan as they contain egg whites), and contain no gluten, dairy, cholesterol, or sulfites.

Preparation

Some recipes use sweetened condensed milk. Macaroons are sometimes baked on edible rice paper placed on a baking tray.

Regional varieties

Dominican Republic

Macaroons in the Dominican Republic are very dark. Grated coconut is mixed with ginger and cinnamon.

France

There are many regional variations of French macaroon. The coconut macaroon is known as the Congolais'.

Germany

Mandelhörnchen (almond crescents) are a common treat in Germany. Made of a flour similar to that of the macaroon, they are formed to resemble a crescent, then covered in sliced almonds and dipped in chocolate.

India

Thoothukudi in Tamil Nadu and Mangalore in Karnataka have their own varieties of macaroon made with cashews and egg whites, adapted from those introduced in colonial times.

Ireland

A macaroon chocolate bar is made by Wilton Candy in County Kildare, described as macaroon pieces in Irish milk chocolate. It was first made in 1937. Cleeve's Irish Confectionery also makes a macaroon chocolate bar, with ingredients including cocoa butter, milk powder and desiccated coconut.

Italy

Italy has a wide tradition of cookies and confections made from ground almonds, including pignoli. Ricciarelli are a soft almond variety originating from Siena. Amaretti di Saronno are a crunchy variety from Saronno.

Philippines

Fig. 2:Philippine coconut macaroons

Philippine coconut macaroons are uniquely cake-like in texture. They are slightly crunchy on the outside and soft, moist and chewy on the inside. They are usually baked into small, colourful cupcake wrappers and topped with a raisin. They are popular during holidays and special occasions.

Puerto Rico

In Puerto Rico, coconut macaroons are called *besitos de coco* (little coconut kisses). A few variations of *besitos de coco* can be found on the island, the most popular ones including lemon zest and vanilla as additional ingredients.

Spain

The *carajito* (little love or darling) is a macaroon variant made with hazelnuts and honey from the town of Salas, Asturias in northern Spain. A larger size version is commonly known as *sultana* or *suspiros del moro* (sighs of the Moor).

Turkey

Acıbademkurabiyesi is a traditional Turkish variety made of almonds, sugar and egg whites. The traditional recipes include a small amount of bitter almonds, which gives this macaroon its name. Because bitter almonds are not readily available, almond extract is typically used as a substitute. These are part of the stock-in trade of almost every bakery in Turkey, as they are seldom made at home.

United Kingdom

In the UK generally, the traditional almond macaroon often includes almond essence to strengthen the flavour, and is topped with half a blanched almond or (to cut costs) an almond flake. Coconut macaroons are also popular.

Scotland

The Scottish macaroon has a dense, sugary centre and is covered in chocolate and roasted coconut. Traditionally, it was made with cold leftovers of mashed potatoes and sugar loaf. When the macaroon bar became commercial, the recipe no longer used mashed potato because of shelf-life limitations. The modern macaroon is made from a combination (depending on producer) of sugar, glucose, water and egg white. These ingredients make a fondant centre. This recipe was reportedly discovered by accident in Coatbridge in 1931, when confectioner John Justice Lees was said to have botched the formula for making a chocolate fondant bar and threw coconut over it in disgust, producing the first macaroon bar. Macaroon chocolate bars are also popular in Scotland. Buchanan's make a macaroon with Belgian chocolate and toasted coconut. They are a long-established family business based in Greenock.

United States

Fig. 3: Coconut macaroons

Fig.4: US commercially made coconut macaroon, with US quarter for size reference

Macaroons come in a variety of flavors, including coconut, chocolate, chocolate chip, vanilla and almond. Commercially-made macaroons are generally dense, moist and sweet. They are available in a few flavors, and often dipped in chocolate. Homemade macaroons and varieties produced by smaller bakeries are commonly light and fluffy. Macaroons made with coconuts are often piped with a star-shaped tip, whereas macaroons made with nuts are more likely shaped individually due to the stiffness of the dough.

4.4 Biscuit

A biscuit, in many English-speaking countries, including Britain, Ireland, Australia, New Zealand, India, and South Africa but not Canada or the US, is a flour-based baked and shaped food item. Biscuits are typically hard, flat, and unleavened. They are usually sweet and may be made with sugar, chocolate, icing, jam, ginger, or cinnamon. They can also be savoury, similar to crackers. Types of biscuit include biscotti, sandwich biscuits, digestive biscuits, ginger biscuits, shortbread biscuits, chocolate chip cookies, chocolate-coated marshmallow treats, Anzac biscuits, and *speculaas*.

In most of North America, nearly all hard sweet biscuits are called "cookies" and savoury biscuits are called crackers, while the term *biscuit* is used for a soft, leavened quick bread similar to a savoury version of a *scone*. In most of the English-speaking world, a "biscuit" is a small, hard baked product

that would be called either a cookie or a cracker in the United States and sometimes in Canada. Biscuits in the United Kingdom, the Isle of Man, and Ireland are usually hard and may be savoury or sweet, such as chocolate biscuits, digestives, hobnobs, ginger nuts, rich tea, shortbread, bourbons, and custard creams. The term *cookie* typically refers to only one type of biscuit (the sweeter baked dough typically containing chocolate chips or raisins); however, it may also locally refer to specific types of biscuits or breads.

Fig.5: Biscuits

In the United States and some parts of Canada, a biscuit is a quick bread, somewhat similar to an unsweetened scone, but with a texture more fluffy and flaky vs. "sturdy and crumbly. Biscuits may be referred to as either baking powder biscuits or buttermilk biscuits if buttermilk is used rather than milk as a liquid, as buttermilk is not only flavourful but acidic (allowing use of baking soda vs. baking powder which is a mixture of baking soda with an acidifier and buffer). A Southern regional variation using the term beaten biscuit (or in New England *sea biscuit*) is closer to hardtack than soft dough biscuits.In Canada, the term *biscuit* can simultaneously refer to what is commonly identified as a biscuit in either the United Kingdom or the United States. The Canadian Oxford Dictionary describes

each word in reference to the other; biscuit can mean Brit. a cookie, whilst cookie can mean N. Amer. a small sweet biscuit. Tea biscuit is also a standard Canadianism for the North American biscuit.

4.5 Muffins

A muffin or bun is an individually portioned baked product; however, the term can refer to one of two distinct items: a part-raised flatbread (like a crumpet) that is baked and then cooked on a griddle (typically unsweetened), or a (often sweetened) quickbread that is chemically leavened and then baked in a mold. While quickbread "American" muffins are often sweetened, there are savory varieties made with ingredients such as corn and cheese, and less sweet varieties like traditional *bran muffins*. The flatbread "English" variety is of British or other European derivation, and dates from at least the early 18th century, while the quickbread originated in North America during the 19th century. Both types are common worldwide today.

Quickbread muffins (sometimes described in Britain as "American muffins are baked, individual-sized, cupcake-shaped foods with a "moist, coarse-grained" texture. Muffins are available in both savoury varieties, such as cornmeal and cheese muffins, or sweet varieties such as blueberry, chocolate chip, lemon or banana flavours. Sweetened muffins range from lightly sweetened muffins to products that are "richer than many cakes in fat and sugar. They are similar to cupcakes in size and cooking methods, the main difference being that cupcakes tend to be sweet desserts using cake batter and which are often topped with sugar icing (American frosting). Muffins may have solid items mixed into the batter, such as berries, chocolate chips or nuts. Fresh baked muffins are sold by bakeries, donut shops and some fast food restaurants and coffeehouses. Factory baked muffins are sold at grocery stores and convenience stores and are also served in some coffeeshops and cafeterias.

Manufacture

Quickbread muffins are made with flour, sieved together with bicarbonate of soda as a raising agent. To this is added butter or shortening, eggs and any flavourings (fruit, such as blueberries, chocolate or banana; or savouries, such as cheese). Commercial muffins may have "modified starches", corn syrup (or high-fructose corn syrup), xanthan gum, or guar gum to increase moisture content and lengthen shelf life (as well, these gums can make added solids, such as chocolate chips, disperse more evenly in the batter).

Bran Muffins

Fig. 6: Oat bran muffins

Bran muffins use less flour and use bran instead, as well as using molasses and brown sugar. The mix is turned into a pocketed muffin tray, or into individual paper moulds, and baked in an oven. Milk is often added, as it contributes to the appealing browning appearance. The results are raised, individual quick breads. The muffin may have toppings added, such as cinnamon sugar, streusel, nuts, or chocolate chips.

Poppyseed Muffins

Fig. 7:Poppyseed muffins on a plate

Poppyseed muffins (or poppy seed muffins) contain poppy seeds. Poppy seeds were already popular in most parts of the world for their taste and texture—as well as the narcotic characteristics of the opium poppy plant they are harvested from. In modern times, growing poppy seeds is a difficult business for

American farmers, due to the risk of heroin production. Other countries have fewer difficulties with permitting the growth of poppies for the seeds alone, which have very low (but still present) levels of opium alkaloids, such as morphine. As other countries began imitating the American muffin, the occasional use of poppy seeds to flavor them spread as well. Although poppy seeds cannot be used as a narcotic due to very low levels of opium alkaloids, they do have enough that drug tests are often fooled and give out false positives after an otherwise drug-free person consumes just a few poppyseed muffins. Because of this, all poppyseed pastries place the person who consumes them prior to a test at a high risk of being inaccurately considered a drug user.

4.6 Sugar Cookery

Sources

1. Sucrose

- Also identified with term Sugar/Sweetness.
- It occurs naturally as a component of carbohydrate of every F&V.
- It is a product of photosynthesis and occurs in great quantities in Sugarcane & Sugar Beets from which it is harvested for commercial use.

2. D-Glucose

- Natural sugar.
- Commonly called as Dextrose in confectionary industry.
- Honey & Fruits also contain glucose.
- Source of glucose for commercial manufacture is -Starch.

3. D-Fructose

- It is a hexose monosaccharide.
- It is a natural sugar.
- Sweeter than sucrose.
- Sources: Honey & Ripe Fruits.
- Used in confectionary to provide sweetness, flavour and color.

4. Dextrose Syrup

- Manufacture of dextrose from starch is a multi-enzyme process.
- It's often used as a sugar substitute and is ideal for applications that require high sweetness and fermentability.

5. Corn Syrup

- It contains 75% Carbohydrate and 25% Water.

- Corn syrup is a food syrup which is made from the starch of corn/maize and contains varying amounts of sugars: glucose, maltose and higher oligosaccharides, depending on the grade.
- It inhibits crystallisation in foods.
- Useful in baked products.
- It enhances citrus flavour in fruit products used in cola beverages.
- It is also available as dried corn syrup used in dry beverage mix, cereal bars, sauce mix, chikki.

6. High Fructose Corn Syrup

- Manufactured from corn starch by enzymatic isomerization.
- Sweeter than glucose.
- Inhibits crystallization in foods.
- Useful in baked products and in cooking.
- Enhances citrus flavour used in cola beverages.
- Marketed in 3 types- 42%, 55 %, 90 %.

7. Iso-Malt

- Derived from Beet Sugar.
- Similar to sugar in sweetness, taste, technological properties.
- Gives body & texture to foods like aspartame and saccharin.
- Less hygroscopic, better shelf life.

8. Malto-Dextrins

- Prepared from Corn Starch by controlled enzymatic hydrolysis.
- Low hygroscopicity, bland flavour, Extremely low sweetness, Inhibits crystal formation in ice-creams.
- Useful in flavour encapsulation and prevention of oxidation of unstable compounds.

9. Molases

- It is the residue that remains after sucrose crystals have been removed from the concentrated juices of sugarcane or beet.
- Contains <25% water &<5% mineral ash.
- Molasses is used in food as a sweetener, to add moisture, and to create consistency and crust.
- It's commonly used in baked goods like cookies, gingerbread, pies, and dark breads.
- Molasses can also add thickness to baked beans, sauces, and marinades.10.

10. Maple Syrup

- Maple syrup is a thick, sweet liquid made from the sap of maple trees.
- It's made by boiling down the sap of the sugar maple or other maple trees.

- Maple syrup is a natural sweetener that can be used in cooking and baking to add a maple flavour and lower glycaemic index than sugar.

11. Honey

- Honey bees collect nectar from flowers and deposit it in the hives where it is converted to honey.
- Bees produce an enzyme Invertase that converts sucrose into glucose and fructose.
- Honey contains 17% water & 80% carbohydrates with small amounts of minerals & vitamins & enzymes.
- Carbohydrate portion includes: - Fructose, Glucose, Maltose, and Sucrose.
- Higher percentage of sucrose indicates adulteration.
- Color of honey is related to its mineral content and is characteristic of its flowers - its source.
- Used for treatment of indigestion, coughs, colds and skin wounds.
- Honey has tendency to retain water and hence cakes and candies made with honey has longer shelf life.

12. Jaggery

- Jaggery is obtained from sugarcane, though it can be prepared from palm, date palm and coconut.
- Jaggery is usually golden yellow in color and has a sweet, winy fragrance and a taste similar to brown sugar or molasses.
- Jaggery is a type of unrefined sugar made from concentrated sugarcane juice that's boiled until it solidifies.
- Used as a substitute for white sugar.
- It adds a sweet taste to curries like sambhar or gujarati curries, and is used in several traditional sweet dishes like chikki, laddus,andpuranpoli.
- Jaggery powder can also be used to add brown color and moisture to pancakes.

Carmel Sugar

- Caramelized sugar is sugar that has been cooked until it browns, giving it an amber color and a rich, slightly sweet, and nutty flavor.
- The process of caramelizing sugar is called pyrolysis, which occurs when sugar is cooked over low heat and oxidizes.
- The amount of water remaining in the sugar during cooking determines the flavor, consistency, and sweetness levels of the caramelized sugar.
- It is used in brewing, vinegar making, whisky, rum & wines as well as soft drinks.

- Also used in Biscuits, Pickles, Sauces and pastries.
- Can be prepared from- Soyabean, Tapoica OR Sago.

Brown Sugar

- Also known as Sugar cane jiggery powder, country sugar or nattu sugar.
- Brown sugar is a soft sugar that is unrefined or partially refined and contains molasses, giving it a distinctive brown color, flavor, and moisture.
- Brown sugar has a deep, caramel or toffee-like flavor and retains moisture, so baked goods made with brown sugar will be softer and denser.
- It contains about the same number of calories per teaspoon as white table sugar, but has slightly more calcium, iron, and potassium.

Properties

1. Solubility

- Sugars are soluble in water.
- Crystallization of sugar occurs in a sufficiently concentrated sugar solution and use of this is made in commercial production of sugar from sugarcane and beets.
- Most soluble sugar is Fructose followed by sucrose & lactose.
- Fructose is much soluble hence difficult to crystallise.

2. Absorption of Moisture

- Sugars are hygroscopic.
- Fructose is more hygroscopic than other sugars.
- Cakes made with honey, molasses remain moist for a long time.

3. Fermentation

- Most sugars except lactose, may be fermented by yeasts to produce CO_2 gas and alcohol.
- It is an important reaction in making bread and other baked products.
- The CO_2 leavens the product and the alcohol volatilises during baking.

Acid Hydrolysis

- Sucrose is easily hydrolysed by acid but Maltose and lactose are slowly acted on.
- End products of sucrose hydrolysis are mixture of Glucose & Fructose commonly called invert sugar.
- Heat accelerates action of acid.

Enzyme Hydrolysis

- The enzyme also called invertase is used in candy industry to hydrolyse some of the sucrose in cream fondant to fructose and glucose.
- This is done to produce soft, semifluid centres in chocolates.
- The enzyme is commonly added to fondant layer around the fruit in chocolate-coated cherries.

Role of Sugar in Cookery

- It is used as sweetening agent in ice-creams and beverages like coffee, tea, cocoa, milk shake and sharbath and sweets.
- It is used in the form of syrup in preparations like gulab jamun and rasagulla.
- In high concentration, it prevents the growth of micro-organisms. This principle is used in preserving jams and jellies.
- Caramel sugar is used in puddings to improve colour and flavour.
- It is used in making bread to increase the fermentation of yeast.
- It gives not only sweetness but also body to the products like jam, pudding, fondant and ice-cream.
- It helps in improving the texture of cake and confectionery.
- Property of crystallisation of sugar is used in preparations like badushah, laddoo, fondant and fudge.

4.7 Cocoa Processing

Cocoa**,** highly concentrated powder made from chocolate liquor—a paste prepared from cocoa beans, the fruit of the cacao—and used in beverages and as a flavouring ingredient. Cocoa is the key ingredient in chocolate and chocolate confections.The cocoa bean is the seed of the cacao tree (*Theobroma cacao*), a tropical plant indigenous to the equatorial regions of the Americas. From the processed cocoa bean comes the fluid paste, or liquor, from which cocoa powder and chocolate are made. Chocolate is sold directly to the consumer as solid bars of eating chocolate, as packaged cocoa, and as baking chocolate. It is also used by confectioners as coating for candy bars and boxed or bulk chocolates, by bakery product manufacturers and bakers as coating for many types of cookies and cakes, and by ice-cream companies as coating for frozen novelties. Cocoa powders, chocolate liquor, and blends of the two are used in bulk to flavour various food products and to provide the flavours in such “chocolate” products as syrups, toppings, chocolate milk, prepared cake mixes, and pharmaceuticals.

Cocoa Bean Processing

Harvesting

Fig. 8: Cacao A cacao farmer using a machete to open a pod of raw cacao (*Theobroma cacao*)for inspection on a plantation in Kumasi, Ghana.

Harvesting of cocoa beans can proceed all year, but the bulk of the crop is gathered in two flush periods occurring from October to February and from May to August. The ripe seed pods are cut from the trees and split open with machetes. The beans, removed from the pods with their surrounding pulp, are accumulated in leaf-covered heaps, in leaf-lined holes dug in the ground, or in large shallow boxes having perforated bottoms to provide for drainage.

Fermentation

Fig. 9: Cocoa beans A worker tending to commercially grown cocoa beans drying in the sun in central Ghana.

The pulp of common grades (Forastero) is allowed to ferment for five to seven days, and the pulp of the more distinctively flavoured grades (Criollo) for one to three days. Frequent turnings dissipate excess heat and provide uniformity. During fermentation, the juicy sweatings of the pulp are drained away, the germ in the seed is killed by the increased heat, and flavour development begins. The beans become plump and full of moisture, and the interior develops a reddish brown colour and a heavy, sharp fragrance. The fermented beans are sun-dried or kiln-dried to reduce moisture content to 6–7 percent and bagged for shipment.

Cleaning, roasting, and grinding

Cocoa beans are subjected to various cleaning processes to remove such contaminants as twigs, stones, and dust. Roasting develops flavour, reduces acidity and astringency, lowers moisture content, deepens colour, and facilitates shell removal. After roasting comes a cracking and fanning (winnowing) process, in which machines crack the shells and then separate them from the heavier nibs by means of blowers. The cell walls of the nibs are in turn broken by grinding, releasing the fat, or cocoa butter, and forming a paste called chocolate liquor, or cocoa mass. If alkalized (Dutched) chocolate liquor is to be produced, the cocoa beans may be winnowed raw; the raw nibs will be alkalized and then roasted prior to grinding.

Conching

Conching, a flavour-developing, aerating, and emulsifying procedure performed by conche machines, requires from 4 to 72 hours, depending on the results desired and the machine type. Temperatures used in this process range from 55 to 88 °C (130 to 190 °F) and are closely controlled to obtain the desired flavour and uniformity.

Molding

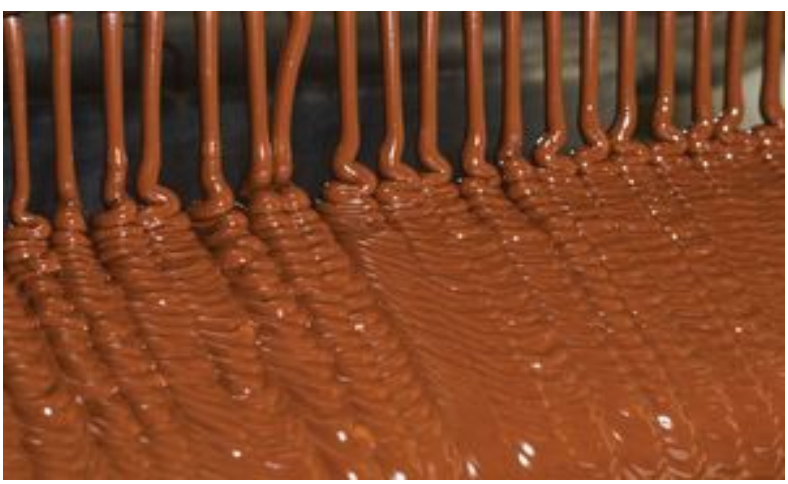

Fig. 10: liquid chocolateLiquid chocolate at a candy factory.

In molding, the chocolate is cast in small consumer-size bars or in blocks weighing about 4.5 kg (10 pounds) for use by confectioners and is then subjected to cold air to produce hardening.

Cocoa bean products

Cocoa powders

Fig. 11: cocoa powder and cocoa beansCocoa powder and roasted cocoa beans.

Cocoa powders are produced by pulverizing cocoa cakes, made by subjecting the chocolate liquor of about 53 to 56 percent cocoa butter content to hydraulic pressing to remove a predetermined amount of cocoa butter. The cocoa butter content remaining in the powder may range from 8 to 36 percent, with the most common commercial grades in the United States containing 11, 17, or 22 percent cocoa butter. In the United Kingdom, cocoa sold for beverage use must contain a minimum of 20 percent.

Natural process

Natural-process cocoa powders and chocolate liquors receive no alkali treatment. Cocoa beans are normally slightly acidic, with a pH of 5.2–5.8. When the pH remains unchanged, the beans produce pleasantly sharp flavours blending well in many foods and confections.

Dutch process

Dutch-process cocoa powders and chocolate liquors are treated at the nib, liquor, or powder stage. The treatment is frequently referred to as “Dutching” because the process, first applied by C.J. van Houten in the Netherlands, was introduced as “Dutch cocoa.” In this alkalizing process, a food-grade alkali solution may be applied in order partially to neutralize the natural cocoa acids, mostly acetic acid like that in vinegar; or it may be used to produce a strictly alkaline product, with a pH as high as 8.0. Potassium carbonate is most commonly used as an alkalizer, although other alkalies, such

as sodium carbonate, may be used. In addition to altering the pH of the cocoa powder, the process darkens colour, mellows flavour, and alters taste characteristics.

4.8 Chocolate Products

Chocolate products usually require the addition of more cocoa butter to that already existing in the chocolate liquor. The various forms of chocolate are available in consumer-size packages and in large bulk sizes for use by food manufacturers and confectioners. Most European confectioners make their own chocolate; other confectioners buy chocolate from chocolate-manufacturing specialists. For large commercial orders, chocolate is shipped, warm and in liquid form, in heated sanitary tank trucks or tank cars.

Baking Chocolate

Baking (bitter) chocolate, popular for household baking, is pure chocolate liquor made from finely ground nibs, the broken pieces of roasted, shelled cocoa beans. This chocolate, bitter because it contains no sugar, can be either the natural or the alkalized type.

Sweet Chocolate

Sweet chocolate, usually dark in colour, is made with chocolate liquor, sugar, added cocoa butter, and such flavourings as vanilla beans, vanillin, salt, spices, and essential oils. Sweet chocolate usually contains at least 15 percent chocolate liquor content, and most sweet chocolate contains 25–35 percent. The ingredients are blended, refined (ground to a smooth mass), and conched. Viscosity is then adjusted by the addition of more cocoa butter, lecithin (an emulsifier), or a combination of both.

Milk Chocolate

Milk chocolate is formulated by substituting whole milk solids for a portion of the chocolate liquor used in producing sweet chocolate. It usually contains at least 10 percent chocolate liquor and 12 percent whole milk solids. Manufacturers usually exceed these values, frequently going to 12–15 percent chocolate liquor and 15–20 percent whole milk solids. Milk chocolate, usually lighter in colour than sweet chocolate, is sweeter or milder in taste because of its lower content of bitter chocolate liquor. Processing is similar to that of sweet chocolate. “Bitter chocolate” refers to either baking chocolate or bittersweet chocolate. Bittersweet is similar to sweet chocolate but contains less sugar and more chocolate liquor. Minimum percentages of chocolate liquor are fixed by law in some countries, such as the United States.

Chocolate-type coatings

Confectionery coatings are made in the same manner as similar chocolate types, but some or all of the chocolate liquor is replaced with equivalent amounts of cocoa powder, and instead of added cocoa butter, with a melting point of about 32–33 °C (90–92 °F), other vegetable fats of equal or higher

melting points are used. In the United States the legal name of this coating is “sweet cocoa and vegetable fat (other than cocoa fat) coatings.” In the “chocolate” coating usually applied to ice cream and other frozen novelties, legally known as “sweet chocolate and vegetable fat (other than cocoa fat) coatings,” the added cocoa butter usual in chocolate is replaced by lower-melting-point vegetable fats, such as coconut oil.

By-products

Shells, the major by-product of cocoa and chocolate manufacturing, represent 8–10 percent of raw cocoa bean weight and are blown off in the cracking and fanning, or winnowing, operation. They are used for fertilizer, mulch, and fuel.

Chocolate and Cocoa Grades

In chocolate and cocoa products, there is no sharp difference from one grade or quality to the next. Chocolate quality depends on such factors as the blend of beans used, with about 20 commercial grades from which to choose; the kind and amount of milk or other ingredients included; and the kind and degree of roasting, refining, conching, or other type of processing employed. Chocolate and cocoa products are only roughly classified; there are hundreds of variations on the market, alone or in combination with other foods or confections.

Care and Storage

Chocolate and cocoa require storage at 18–20 °C (65–68 °F), with relative humidity below 50 percent. High (27–32 °C, or 80–90 °F) or widely fluctuating temperatures will cause fat bloom, a condition in which cocoa butter infiltrates to the surface, turning products gray or white as it recrystallizes. High humidity causes mustiness in cocoa powder and can lead to mold formation in cocoa powder or on chocolate. Excessive moisture can also dissolve sugar out of chocolate, redepositing it on the surface as sugar bloom, distinguished from fat bloom by its sandy texture.

Nutritive Value

Fig. 12: Health benefits of eating chocolateLearn how eating chocolate can help stave off health problems, including heart disease and strokes

Cocoa, a highly concentrated food providing approximately 1,000 calories per kilogram, provides carbohydrates, fat, protein, and minerals. Its theobromine and caffeine content produce a mildly stimulating effect. The carbohydrates and easily digested fats in chocolate make it an excellent high-energy food. Chocolate, food product made from cocoa beans, consumed as candy and used to make beverages and to flavour or coat various confections and bakery products. Rich in carbohydrates, it has several health benefits and is an excellent source of quick energy. It also contains minute amounts of the stimulating alkaloids caffeine and theobromine, which is highly toxic to dogs.

Chocolate

Chocolate is a food made from roasted and ground cocoa beans that can be a liquid, solid, or paste, either on its own or as a flavoring in other foods. The cacao tree has been used as a source of food for at least 5,300 years, starting with the Mayo-Chinchipe culture in what is present-day Ecuador. Later, Mesoamerican civilizations consumed cacao beverages, of which one, chocolate, was introduced to Europe in the 16th century.

The seeds of the cacao tree (*Theobroma cacao*) have an intense bitter taste and must be fermented to develop the flavor. After fermentation, the seeds are dried, cleaned, and roasted. The shell is removed to produce nibs, which are then ground to cocoa mass, unadulterated chocolate in rough form. Once the cocoa mass is liquefied by heating, it is called chocolate liquor. The liquor may also be cooled and processed into its two components: cocoa solids and cocoa butter. Baking chocolate, also called bitter chocolate, contains cocoa solids and cocoa butter in varying proportions without any added sugar. Powdered baking cocoa, which contains more fiber than cocoa butter, can be processed with alkali to produce Dutch cocoa. Much of the chocolate consumed today is in the form of sweet chocolate, a

combination of cocoa solids, cocoa butter, and added vegetable oils and sugar. Milk chocolate is sweet chocolate that additionally contains milk powder. White chocolate contains cocoa butter, sugar, and milk, but no cocoa solids.

Chocolate is one of the most popular food types and flavors in the world, and many foodstuffs involving chocolate exist, particularly desserts, including cakes, pudding, mousse, brownies, and chocolate chip cookies. Many candies are filled with or coated with sweetened chocolate. Chocolate bars, either made of solid chocolate or other ingredients coated in chocolate, are eaten as snacks. Gifts of chocolate molded into different shapes (such as eggs, hearts, and coins) are traditional on certain Western holidays, including Christmas, Easter, Valentine's Day, and Hanukkah. Chocolate is also used in cold and hot beverages, such as chocolate milk and hot chocolate, and in some alcoholic drinks, such as crème de cacao.

Although cocoa originated in the Americas, West African countries, particularly Ivory Coast and Ghana, are the leading producers of cocoa in the 21st century, accounting for some 60% of the world cocoa supply. A 2020 report estimated that more than 1.5 million children are involved in the farming of cocoa in Côte d'Ivoire and Ghana. Child slavery and trafficking associated with the cocoa trade remain major concerns. A 2018 report argued that international attempts to improve conditions for children were doomed to failure because of persistent poverty, the absence of schools, increasing world cocoa demand, more intensive farming of cocoa, and continued exploitation of child labor.

Varieties

The three main varieties of cocoa beans used in chocolate are criollo, forastero, and trinitario.

Processing

Cocoa pods are harvested by cutting them from the tree using a machete, or by knocking them off the tree using a stick. It is important to harvest the pods when they are fully ripe, because if the pod is unripe, the beans will have a low cocoa butter content, or low sugar content, reducing the ultimate flavor.

4.9 Fermentation

The beans (which are sterile within their pods) and their surrounding pulp are removed from the pods and placed in piles or bins to ferment. Micro-organisms, present naturally in the environment, ferment the pectin-containing material. Yeasts produce ethanol, lactic acid bacteria produce lactic acid, and acetic acid bacteria produce acetic acid. In some cocoa-producing regions an association

between filamentous fungi and bacteria (called cocobiota) acts to produce metabolites beneficial to human health when consumed. The fermentation process, which takes up to seven days, also produces several flavor precursors, that eventually provide the chocolate taste.

After fermentation, the beans must be dried to prevent mold growth. Climate and weather permitting, this is done by spreading the beans out in the sun from five to seven days. In some growing regions (for example, Tobago), the dried beans are then polished for sale by "dancing the cocoa": spreading the beans onto a floor, adding oil or water, and shuffling the beans against each other using bare feet.

In an alternative process known as moist incubation, the beans are dried without fermentation. The nibs are then removed and hydrated in an acidic solution. They are heated for 72 hours and dried again. Gas chromatography/mass spectrometry showed that the incubated chocolate had higher levels of Strecker aldehydes, and lower levels of pyrazines.

Grinding and Blending

A chocolate mill (right) grinds and heats cocoa kernels into chocolate liquor. A melanger (left) mixes milk, sugar, and other ingredients into the liquor. The dried beans are then transported to a chocolate manufacturing facility. The beans are cleaned (removing twigs, stones, and other debris), roasted, and graded. Next, the shell of each bean is removed to extract the nib. The nibs are ground and liquefied, resulting in pure chocolate liquor. The liquor can be further processed into cocoa solids and cocoa butter. Producers of high-quality, small-batch chocolate argue that mass production produces bad-quality chocolate. Some mass-produced chocolate contains much less cocoa (as low as 7% in many cases), and fats other than cocoa butter. Vegetable oils and artificial vanilla flavor are often used in cheaper chocolate to mask poorly fermented and/or roasted beans.

Conching and Refining

The penultimate process is called conching. A conche is a container filled with metal beads, which act as grinders. The refined and blended chocolate mass is kept in a liquid state by frictional heat. Chocolate before conching has an uneven and gritty texture. The conching process produces cocoa and sugar particles smaller than the tongue can detect (typically around 20 μm) and reduces rough edges, hence the smooth feel in the mouth. The length of the conching process determines the final smoothness and quality of the chocolate. High-quality chocolate is conched for about 72 hours, and lesser grades about four to six hours. After the process is complete, the chocolate mass is stored in tanks heated to about 45 to 50 °C (113 to 122 °F) until final processing.

Tempering

After conching, chocolate is tempered. This process aims to create a crystallize a small amount of fat in a particularly stable formation. Around this small amount of crystals, the rest of the fats crystallize, creating a glossy chocolate, with a crisp break.

Shaping


C

Fig. 13: Chocolate cubes, *pistoles* and *callets*

Chocolate is molded in different shapes for different uses:

- Chocolate bars (tablets) are rectangular blocks of chocolate meant to be broken down to cubes (or other predefined shapes), which can then be used for consumption, cooking and baking. The term is also used for combination bars, which are a type of candy bars
- Chocolate chips are small pieces of chocolate, usually drop-like, which are meant for decoration and baking
- *Pistoles*, *callets* and *fèves* are small, coin-like or bean-like pieces of chocolate meant for baking and patisserie applications (also see Pistole (coin) and Fève (trinket))
- Chocolate blocks are large, cuboid chunks of chocolate meant for professional use and further processing
- Other, more specialized shapes for chocolate include sticks, curls and hollow semi-spheres

Storage

Chocolate is very sensitive to temperature and humidity. Ideal storage temperatures are between 15 and 17 °C (59 and 63 °F), with a relative humidity of less than 50%. If refrigerated or frozen without

containment, chocolate can absorb enough moisture to cause a whitish discoloration, the result of fat or sugar crystals rising to the surface. Various types of "blooming" effects can occur if chocolate is stored or served improperly.

Chocolate bloom is caused by storage temperature fluctuating or exceeding 24 °C (75 °F), while sugar bloom is caused by temperature below 15 °C (59 °F) or excess humidity. To distinguish between different types of bloom, one can rub the surface of the chocolate lightly, and if the bloom disappears, it is fat bloom. Moving chocolate between temperature extremes, can result in an oily texture. Although visually unappealing, chocolate suffering from bloom is safe for consumption and taste is unaffected. Bloom can be reversed by retempering the chocolate or using it for any use that requires melting the chocolate.

Chocolate is generally stored away from other foods, as it can absorb different aromas. Ideally, chocolates are packed or wrapped, and placed in proper storage with the correct humidity and temperature. Additionally, chocolate is frequently stored in a dark place or protected from light by wrapping paper. The glossy shine, snap, aroma, texture, and taste of the chocolate can show the quality and whether it was stored well.

Health effects

Nutrition

One hundred grams of milk chocolate supplies 540 calories. It is 59% carbohydrates (52% as sugar and 3% as dietary fiber), 30% fat and 8% protein (table). Approximately 65% of the fat in milk chocolate is saturated, mainly palmitic acid and stearic acid, while the predominant unsaturated fat is oleic acid.100-grams of milk chocolate is an *excellent source* (over 19% of the Daily Value, DV) of riboflavin, vitamin B12 and the dietary minerals, manganese, phosphorus and zinc. Chocolate is a *good source* (10–19% DV) of calcium, magnesium and iron.

Phytochemicals

Chocolate contains polyphenols, especially flavan-3-ols (catechins) and smaller amounts of other flavonoids. It also contains alkaloids, such as theobromine, phenethylamine, and caffeine, which are under study for their potential effects in the body.

Heavy Metals

Fig. 14: Assorted chocolates

It is unlikely that chocolate consumption in small amounts causes lead poisoning. Some studies have shown that lead may bind to cocoa shells, and contamination may occur during the manufacturing process. One study showed the mean lead level in milk chocolate candy bars was 0.027 μg lead per gram of candy; another study found that some chocolate purchased at U.S. supermarkets contained up to 0.965 μg per gram, close to the international (voluntary) standard limit for lead in cocoa powder or beans, which is 1 μg of lead per gram. In 2006, the U.S. FDA lowered by one-fifth the amount of lead permissible in candy, but compliance is only voluntary.

Studies concluded that "children, who are big consumers of chocolates, may be at risk of exceeding the daily limit of lead; whereas one 10 g cube of dark chocolate may contain as much as 20% of the daily lead oral limit. "Moreover chocolate may not be the only source of lead in their nutrition and chocolate might be a significant source of cadmium and lead ingestion, particularly for children. According to a 2005 study, the average lead concentration of cocoa beans is ≤ 0.5 ng/g, which is one of the lowest reported values for a natural food. However, during cultivation and production, chocolate may absorb lead from the environment (such as in atmospheric emissions of now unused leaded gasoline).

The European Food Safety Authority recommended a tolerable weekly intake for cadmium of 2.5 micrograms per kg of body weight for Europeans, indicating that consuming chocolate products caused exposure of about 4% among all foods eaten. Maximum levels for baby foods and chocolate/cocoa products were established under Commission Regulation (EU) No 488/2014. 1986

California Proposition 65 requires a warning label on chocolate products having more than 4.1 mg of cadmium per daily serving of a single product.

4.10 Candy

Candy, known also as sweets and confectionery, has a long history as a familiar food treat that is available in many varieties. Candy varieties are influenced by the size of the sugar crystals, aeration, sugar concentrations, colour and the types of sugar used. Simple sugar or sucrose is turned into candy by dissolving it in water, concentrating this solution through cooking and allowing the mass either to form a mutable solid or to recrystallize. Maple sugar candy has been made in this way for thousands of years, with concentration taking place from both freezing and heating. Other sugars, sugar substitutes, and corn syrup are also used. Jelly candies, such as gumdrops and gummies, use stabilizers including starch, pectin or gelatin. Another type of candy is cotton candy, which is made from spun sugar.

Candy**,** sweet food product, the main constituent of which generally is sugar. The application of the terms *candy* and *confectionery* varies among English-speaking countries. In the United States *candy* refers to both chocolate products and sugar-based confections; elsewhere "chocolate confectionery" refers to chocolates, "sugar confectionery" to the various sugar-based products, and "flour confectionery" to products such as cakes and pastries. This article is primarily concerned with sugar confectionery. Other types of confections are discussed in the articles baking and cocoa.

Ingredients

Sweeteners

Sugar, mainly sucrose from sugar beets or sugarcane, is the major constituent of most candies. Other sweeteners employed in candy manufacture include corn syrup, corn sugar, honey, molasses, maple sugar, and noncaloric sweeteners. Sweeteners may be used in dry or liquid form. Invert sugar, a mixture of glucose (dextrose) and fructose produced from sugar (sucrose) by application of heat and an acid "sugar doctor," such as cream of tartar or citric acid, affects the sweetness, solubility, and amount of crystallization in candymaking. Invert sugar is also prepared as a syrup of about 75 percent concentration by the action of acid or enzymes on sugar in solution.

Texturizers and Flavourings

Because of the perishability of fresh fluid milk and milk products, milk is usually used in concentrated or dried form. It contributes to candy flavour, colour, and texture. Fats, usually of vegetable origin, are primarily used to supply textural and "mouth feel" properties (lubrication and smoothness). They are

also used to control crystallization and to impart plasticity. Such colloids as gelatin, pectin, and egg albumin are employed as emulsifying agents, maintaining fat distribution and providing aeration. Other ingredients include fruits; nuts; natural, fortified, and artificial flavours; and colourings.

Products

Candies can be divided into noncrystalline, or amorphous, and crystalline types. Noncrystalline candies, such as hard candies, caramels, toffees, and nougats, are chewy or hard, with homogeneous structure. Crystalline candies, such as fondant and fudge, are smooth, creamy, and easily chewed, with a definite structure of small crystals.

High-boiled, or hard, candy

Properties

Fig. 15: The science of making candy
See a lemon drop candy-making demonstration from a scientific perspective.

Sugar has the property of forming a type of noncrystalline glass that forms the basis of hard candy products. Sugar and water are boiled until the concentration of the solution reaches a high level, and supersaturation persists upon cooling. This solution takes a plastic form and on further cooling becomes a hard, transparent, glassy mass containing less than 2 percent water.

High-boiled sugar solutions are unstable, however, and will readily crystallize unless preventative steps are taken. Control of modern sugar-boiling processes is precise. Crystallization is prevented by adding either manufactured invert sugar or corn syrup. The latter is now favoured because it contains complex saccharides and dextrins that, in addition to increasing solubility, give greater viscosity, considerably retarding crystallization.

Hard Candy Manufacture

Originally, hard candy syrups were boiled over a coke or gas fire. Modern manufacturers use pans jacketed with high-pressure steam for batch boiling. Special steam-pressure cookers through which

syrup passes continuously are used when a constant supply is required. For flavouring and colouring, the batch of boiled syrup is turned out on a table to cool. While still plastic, the ingredients are kneaded into the batch; this may be done mechanically. In continuous production, flavours may be added to the hot liquid syrup. Especially prepared sealedflavours are then required to prevent loss by evaporation.

After flavouring, the plastic mass is shaped by passing through rollers with impressions or through continuous forming machines that produce a “rope” of plastic sugar. By feeding a soft filling into the rope as a core, bonbons are made.Asatinlike finish may be obtained by pullingthe plastic sugar. This consists of stretching the plastic mass on rotating arms and at the same time repeatedly overlapping. With suitable ratios of sugar to corn syrup, pulling will bring about partial crystallization and a short, spongy texture will result.

4.11 Toffee

Toffee is an English confection made by caramelizing sugar or molasses (creating inverted sugar) along with butter, and occasionally flour. The mixture is heated until its temperature reaches the hard crack stage of 149 to 154 °C (300 to 310 °F). While being prepared, toffee is sometimes mixed with nuts or raisins.Toffee is a type of candy that is made by cookingsugar and butter until it reaches a hard candy consistency**.** To achieve the desired texture and beautiful deep amber color, **a** candy thermometer **is** absolutely necessary to monitor the temperature accurately. Once the toffee mixture reaches the desired temperature, it is poured onto a surface to cool and harden. The exact recipe and additional ingredients can vary based on personal preference.

Traditional Toffee Requires Only 2 Main Ingredients

- Toffee requires white sugar and butter.
- White granulated sugar provides the sweetness and structure needed for the toffee.
- When choosing butter for toffee, choose salted butter, which helps prevent "splitting". Splitting happens when the toffee mixture separates, resulting in a greasy layer on top and a grainy layer underneath.
- A few sources insist that English butter toffee uses brown sugar and toffee with white sugar and butter is called buttercrunch. But the vast majority disagree with this assessment.

What is the scientific purpose of butter in Toffee?

The scientific purpose of butter in making toffee serves multiple functions in the cooking process:

1. Flavor and Aroma: Butter contains milk solids that contribute to its unique flavor and aroma. When added to toffee, it imparts a rich, creamy, and slightly nutty taste that enhances the overall flavor profile.
2. Texture and Creaminess: Butter is a fat, and its inclusion in toffee adds richness and creaminess to the final product. The fat content in butter contributes to the smooth and velvety texture of the toffee, making it more enjoyable to eat.
3. Preventing Sugar Crystallization: The presence of butter helps to inhibit sugar crystallization during the cooking process. Sugar crystals can cause a grainy texture in the toffee. The fat in butter coats the sugar crystals, interfering with their ability to come together and form larger crystals, resulting in a smoother toffee texture.
4. Heat Transfer and Temperature Control: Butter has a lower melting point compared to sugar, so when it is added to the toffee mixture, it helps to lower its overall temperature. This allows for better heat transfer and helps prevent the sugar from reaching excessively high temperatures, which can lead to burning or scorching.

Variants and Applications

A popular variant in the United States is *English toffee*, which is a very buttery toffee often made with almonds. It is available in both chewy and hard versions. Heath bars are a brand of confection made with an English toffee core. Although named *English toffee,* it bears little resemblance to the wide range of confectionery known as toffee currently available in the United Kingdom. However, one can still find this product in the UK under the name butter crunch.

Etymology

The origins of the word are unknown. Food writer Harold McGee claims it to be "from the Creole for a mixture of sugar and molasses", but which creole language is not specified. The *Oxford English Dictionary* dates the first publication of the word to 1825 and identifies it as a variation of the word *taffy* (1817), both of which are first recorded as English dialectical words.

4.12 Pies

A pie is a baked dish which is usually made of a pastry dough casing that contains a filling of various sweet or savoury ingredients. Sweet pies may be filled with fruit (as in an apple pie), nuts (pecan pie), fruit preserves (jam tart), brown sugar (sugar pie), sweetened vegetables (rhubarb pie), or with thicker fillings based on eggs and dairy (as in custard pie and cream pie). Savoury pies may be filled with meat (as in a steak pie or a Jamaican patty), eggs and cheese (such as quiches or British

flans) or a mixture of meat and vegetables (pot pie).Pies are defined by their crusts. A *filled* pie (also *single-crust* or *bottom-crust*), has pastry lining the baking dish, and the filling is placed on top of the pastry but left open. A *top-crust* pie has the filling in the bottom of the dish and is covered with a pastry or other covering before baking. A two-crust pie has the filling completely enclosed in the pastry shell. Shortcrust pastry is a typical kind of pastry used for pie crusts, but many things can be used, including baking powder biscuits, mashed potatoes, and crumbs.

Pies can be a variety of sizes, ranging from bite-size to those designed for multiple servings.The first known use of the word pie appears in 1303 in the expense accounts of the Bolton Priory in Yorkshire. However, the Oxford English Dictionary is uncertain to its origin and says 'no further related word is known outside English'. A possible origin is that the word 'pie' is connected with a word used in farming to indicate 'a collection of things made into a heap', for example a heap of potatoes covered with earth.

One source of the word pie may be the magpie, a bird known for collecting odds and ends in its nest; the connection could be that Medieval pies also contained many different animal meats, including chickens, crows, pigeons and rabbits. One 1450 recipe for gretepyes that might support the magpie etymology contained what Charles Perry called "odds and ends", including: beef, beef suet, capons, hens, both mallard and teal ducks, rabbits, woodcocks and large birds such as herons and storks, plus beef marrow, hard-cooked egg yolks, dates, raisins and prunes.

Cream filled or topped pies are favourite props for slapstick humour. Throwing a pie in a person's face has been a staple of film comedy since Ben Turpin received one in *Mr. Flip* in 1909.[34] More recently, pieing has also become a political act; some activists throw cream pies at politicians and other public figures as a form of protest.

4.13 Fudge

Fudge is a type of dessert bar that is made by mixing sugar, butter and milk. It has its origins in the 17th century United States, and became popular in American women's colleges in the late 19th century. Fudge can come in a variety of flavorings depending on the region or country it was made; popular flavors include fruit, nut, chocolate and caramel. Fudge is often bought as a gift from a gift shop in tourist areas and attractions.The term *fudge* is said to have originated in the 17th century from the verb *fadge* and means to fit together in a clumsy manner. During this period, *fudge* was used as an interjection by sailors to respond to nonsense or untruth.

Fudge as a confection gained traction in the United States during the late 19th century; recipes for fudge were printed in many periodicals and advertisements during the 1880s. Its inexpensive,

unrefined qualities made it popular among people looking for an alternative that fell between expensive candies and the cheapest sweets. Specialized fudge shops began opening in tourist places such as Mackinac Island, Michigan, in 1887. The increase in fudge's popularity was partly due to the accessibility of its production process: ordinary people were able to make it in their homes without any specialized equipment. In addition, the cost of refined white sugar had been decreasing at the time, cutting production costs.

4.14 Fondant

Fondant is a mixture of sugar and water used as a confection, filling, or icing. Sometimes gelatin and glycerine are used as softeners or stabilizers.There are numerous varieties of fondant, with the most basic being poured fondant. Others include fondant icing, chocolate fondant, and honey fondant.*Poured fondant* is a creamy confection used as a filling or coating for cakes, pastries, and candies or sweets.In its simplest form, it is sugar and water. Sometimes it is stabilized with gelatin and glycerine. It is cooked to the soft-ball stage, cooled slightly, and stirred or beaten to incorporate air, until it is an opaque mass with a creamy consistency. Sometimes lemon or vanilla is added to the mixture for taste. Other flavorings are used as well, as are various colorings. An example of its use is the Cadbury Creme Egg, the filling of which is inverted sugar syrup, produced by processing fondant with invertase. Fondant fancies are a type of cake typically coated in poured fondant.[2]

Poured fondant is formed by supersaturating water with sucrose. More than twice as much sugar dissolves in water at the boiling point as at room temperature. After the sucrose dissolves, if the solution is left to cool undisturbed, the sugar remains dissolved in a supersaturated solution until nucleation occurs. While the solution is supersaturated, if a seed crystal (undissolved sucrose) is put into the mix or if the solution is agitated, the dissolved sucrose crystallizes to form large, crunchy crystals (which is how rock candy is made). However, if the solution is left to cool undisturbed and is then stirred vigorously, it forms many tiny crystals, resulting in a smooth-textured fondant.

4.15 Marshmallow

Marshmallow is a confectionery made from sugar, water and gelatin whipped to a solid-but-soft consistency. It is used as a filling in baking or molded into shapes and coated with corn starch. This sugar confection is inspired by a medicinal confection made from *Althaea officinalis*, the marsh-mallow plant.

Fig.16: The marsh-mallow plant (*Althaea officinalis*)

The word marshmallow comes from the mallow plant species (*Althaea officinalis*), a wetland weed native to parts of Europe, North Africa, and Asia that grows in marshes and other damp areas. The plant's stem and leaves are fleshy, and its white flower has five petals. It is not known exactly when marshmallows were invented, but their history goes back as early as 2000 BCE. Ancient Egyptians were said to be the first to make and use the root of the plant to soothe coughs and sore throats and to heal wounds. The first marshmallows were prepared by boiling pieces of root pulp with honey until thick. Once thickened, the mixture was strained, cooled, then used as intended.

Whether used for candy or medicine, the manufacture of marshmallows was limited to a small scale. In the early to mid 19th century, the marshmallow had made its way to France, where confectioners augmented the plant's traditional medicinal value. Owners of small confectionary stores would whip the sap from the mallow root into a fluffy candy mold. This candy, called Pâte de Guimauve, was a spongy-soft dessert made from whipping dried marshmallow roots with sugar, water, and egg whites.It was sold in bar form as a lozenge. Drying and preparation of the marshmallow took one to two days before the final product was produced. In the late 19th century, candy makers started looking for a new process and discovered the starch mogul system, in which trays of modified corn starch had a mold firmly pushed down in them to create cavities within the starch. The cavities were then filled with the whipped marshmallow sap mixture and allowed to cool or harden. At the same time, candy makers began to replace the mallow root with gelatin, which created a stable form of marshmallow.

4.16 Chewing Gum

Chewing gum is a soft, cohesive substance designed to be chewed without being swallowed. Modern chewing gum is composed of gum base, sweeteners, softeners/plasticizers, flavors, colors, and, typically, a hard or powdered polyol coating. Its texture is reminiscent of rubber because of the physical-chemical properties of its polymer, plasticizer, and resin components, which contribute to its elastic-plastic, sticky, chewy characteristics.

Fig. 17: Sticks of Fruit Stripe chewing gum

Traditional extraction of chicle from *chicozapote* tree (Achras zapota) in Quintana Roo, Mexico. This way of extracting by making zigzag incisions has been known since the ancient Mayan civilization, who called it *sicté*.The cultural tradition of chewing gum seems to have developed through a convergent evolution process, as traces of this habit have arisen separately in many early civilizations. Each early precursor to chewing gum was derived from natural growths local to the region and was chewed purely out of the instinctual desire to masticate. Early chewers did not necessarily desire to derive nutritional benefits from their chewable substances but at times sought taste stimuli and teeth cleaning or breath-freshening capabilities.

Chewing gum in many forms has existed since the Neolithic period. 5,000-year-old chewing gum made from birch bark tar, with tooth imprints, has been found in Kierikki in Finland. The tar from which the gums were made is believed to have antiseptic properties and other medicinal benefits. It is chemically similar to petroleum tar and is in this way different from most other early gum. The Mayans and Aztecs were the first to exploit the positive properties of gum; they used chicle, a natural tree gum, as a base for making a gum-like substance and to stick objects together in everyday

use. Forms of chewing gum were also chewed in Ancient Greece. The Ancient Greeks chewed mastic gum, made from the resin of the mastic tree. Mastic gum, like birch bark tar, has antiseptic properties and is believed to have been used to maintain oral health. Both chicle and mastic are tree resins. Many other cultures have chewed gum-like substances made from plants, grasses, and resins.

4.17 Jelly

Jelly, a semitransparent confection consisting of the strained juice of various fruits or vegetables, singly or in combination, sweetened, boiled, slowly simmered, and congealed, often with the aid of pectin, gelatin, or a similar substance.

Fig. 18: Jelly, jam, and fruit preservesHomemade jellies, jams, and fruit preserves in jars.

The juices of most fruits and berries and many vegetables are suitable for processing into jelly. Juices high in pectin, such as those of citrus fruits and apples, congeal readily after cooking with sugar and may be added to the juices of low-pectin fruits, vegetables, and herbs, such as blueberries, green peppers, or mint, to promote gelling. Preserves, jams, conserves, and marmalades differ from jellies in their inclusion of whole fruit or fruit pulp.

Fig. 19: How to make elderberry jelly

In the United States and elsewhere, fruit and berry jellies are eaten on breakfast breads and in the perennially popular peanut butter and jelly sandwich. Jams and preserves are a ubiquitous accompaniment to the scones and other baked goods of the British tea meal. Vegetable and herb jellies, such as those cooked from peppers, tomatoes, or mint, traditionally complement lamb and other meat dishes.

4.18 Confectionery

Confectionery is the art of making confections, or sweet foods. Confections are items that are rich in sugar and carbohydrates although exact definitions are difficult. In general, however, confections are divided into two broad and somewhat overlapping categories: bakers' confections and sugar confections.Bakers' confectionery, also called flour confections, includes principally sweet pastries, cakes, and similar baked goods. Baker's confectionery excludes everyday breads, and thus is a subset of products produced by a baker.

Sugar confectionery includes candies (also called *sweets*, short for *sweetmeats*, in many English-speaking countries), candied nuts, chocolates, chewing gum, bubble gum, pastillage, and other confections that are made primarily of sugar. In some cases, chocolate confections (confections made of chocolate) are treated as a separate category, as are sugar-free versions of sugar confections. The words *candy* (Canada and US), *sweets* (UK, Ireland, and others), and *lollies* (Australia and New Zealand) are common words for some of the most popular varieties of sugar confectionery.

The occupation of confectioner encompasses the categories of cooking performed by both the French *patissier* (pastry chef) and the *confiseur* (sugar worker). The confectionery industry also includes specialized training schools and extensive historical records.Traditional confectionery goes back to ancient times and continued to be eaten through the Middle Ages and into the modern era.

4.19 Summary

Under this unit we have summarized the about cookies, macroons muffins, biscuits, cocoa products and fermentation etc. successfully. The cookie packaging industry in the United Kingdom is an essential component of the bakery and food retail sectors. As the market for homemade cookies continues to grow, so does the demand for attractive, functional, and sustainable packaging solutions. For both small-scale bakers and established brands, cookie packaging not only protects the product but also serves as a key marketing tool, often influencing consumer decisions through design, material quality, and ease of use. The UK market has seen a significant shift toward sustainable and recyclable packaging materials, driven by both environmental concerns and consumer demand. This part provides a comprehensive overview of cookie packaging, covering its significance, materials, and regulatory considerations for those interested in selling or gifting homemade cookies.

Bran muffins use less flour and use bran instead, as well as using molasses and brown sugar. The mix is turned into a pocketed muffin tray, or into individual paper moulds, and baked in an oven. Milk is often added, as it contributes to the appealing browning appearance. The result are raised, individual quickbreads. The muffin may have toppings added, such as cinnamon sugar, streusel, nuts, or chocolate chips. Philippine coconut macaroons are uniquely cake-like in texture. They are slightly crunchy on the outside and soft, moist and chewy on the inside. They are usually baked into small, colourful cupcake wrappers and topped with a raisin. They are popular during holidays and special occasions

Industrial fermentation can be used for enzyme production, where proteins with catalytic activity are produced and secreted by microorganisms. The development of fermentation processes, microbial strain engineering and recombinant gene technologies has enabled the commercialization of a wide range of enzymes. Enzymes are used in all kinds of industrial segments, such as food (lactose removal, cheese flavor), beverage (juice treatment), baking (bread softness, dough conditioning), animal feed, detergents (protein, starch and lipid stain removal), textile, personal care and pulp and paper industries.

4.20 Terminal questions

Q. 1 What do you mean by cookies**?** Explain it.

Answer:----------

Q. 2 Describe the importance of cocoa and cocoa processing **.**

Answer:----------

Q. 3 Describe the chocolate products and chewing gum.

Answer:----------

Q. 4 Write short notes on the following.

(a) Chewing gum

(b) Marshmallow

Answer:----------

Q. 5 Write a short notes on confectionery.

Answer:----------

Q. 6 Write short notes on the following.

(a) Fondant

(b) Fudge

(c) Jelly

Further readings

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
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- Textbook of Nutrition and Dietetics- Monika Sharma

Unit- 5: Menu Planning and Food Facilities

Structure

Objectives

5.1 Introduction

5.2 History

5.3 Factors Affecting Menu Planning

5.4 Economics of Menu Production

5.5 Puffery

5.6 Pre-Harvest Considerations

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Further readings

5.1 Introduction

A menu is the statement or a list of food and beverage items sold to the customer by a food service. Menu is the core component in a food service operation and is the focal point around which the entire activities of a food service revolve. A good menu needs to satisfy the customer and fulfill managerial objectives of facing competitions and run a successful food service operation. A menu is the statement or a list of food and beverage items sold to the customer by a food service. The word “menu” is French ms which are used in cuisine. Menu is derived from the Latin “minutus” which means something small. Menu should have come into existence when people started eating out. The first menu served was a limited one in 512 B.C at Egypt with just three items. Originally the menu was not presented at the table before the guest.

A long list of items for nearly 10 to 40 dishes was written and was set at the end of the table for the diners to read. It is said that in 1541 the Duke Henry of Brunswick referred to a long list of dishes and by referring it he could reserve his appetite and know beforehand what food item was coming. Hence may be from such an event the menu originated.Menu controls each subsystem. It controls labour cost, food cost, the layout of a food service, equipment needed to produce and foods to be purchased. It is a sales tool for food service operations and hence is important for a food service.

Objectives

This is the fifth unit **(**Menu Planning and Food Facilities) of second block (Preparation and Quality Evaluation of Biscuits and Menu Planning and Food Facilities). After studying this unit, you will be able to:

- To discuss the factors affecting menu planning
- To discuss the economics of menu production
- To discuss recommended handling of specific vegetables and fruits
- To discuss storage of fruits and vegetables and methods of waste disposal

In a restaurant, the menu is a list of food and beverages offered to the customer. A menu may be à la carte – which presents a list of options from which customers choose, often with prices shown – or table d'hôte, in which case a pre-established sequence of courses is offered. Menus may be printed on paper sheets provided to the diners, put on a large poster or display board inside the establishment, displayed outside the restaurant, or put on a digital screen. Since the late 1990s, some restaurants have put their menus online.Menus are also often a feature of very formal meals other than in restaurants,

for example at weddings. In the 19th and 20th centuries printed menus were often used for society dinner-parties in homes; indeed this was their original use in Europe.

5.2 History

Historical menu card of the banquet for German Emperor Wilhelm II and Empress Auguste Viktoria on September 7, 1898, at the Hotel Kaiserhof, Porta WestfalicaA lighted display board-style menu outside a French Kebab restaurant.Menus, as lists of prepared foods, have been discovered dating back to the Song dynasty in China. In the larger cities of the time, merchants found a way to cater to busy customers who had little time or energy to prepare an evening meal. The variation in Chinese cuisine from different regions led caterers to create a list or menu for their patrons.The word menu, like much of the terminology of cuisine, is French in origin. It ultimately derives from Latin "minutus", something made small; in French, it came to be applied to a detailed list or *résumé* of any kind. The original menus that offered consumers choices were prepared on a small chalkboard, in French a *carte*; so foods chosen from a bill of fare are described as à la carte, according to the board.

During the second half of the 18th century, and especially after the French Revolution in 1789, they spread to restaurants. Before then, eating establishments or *tables d'hôte* served dishes chosen by the chef or proprietors. Customers ate what the house was serving that day, as in contemporary banquets or buffets, and meals were served from a common table. The establishment of restaurants and restaurant menus allowed customers to choose from a list of unseen dishes, which were produced to order according to the customer's selection. A *table d'hôte* establishment charged its customers a fixed price; the menu allowed customers to spend as much or as little money as they chose.

5.3 Factors Affecting Menu Planning

Planning menu is an art and it should be done to satisfy the customer and the management. The factors affecting menu planning can be broadly based on

- The customer
- The management

The Customer

Food habits and preferences:

A primary consideration in planning a menu should be the food habits and preferences prevailing in the region where the food service outlet is located. Cultural food habits, regional food preferences are

important in planning the menu. For example the consumption of pork and beef is not appreciated in certain communities and this has to be taken into account while the menu is planned.A preliminary analysis of food habits and preferences will enable the caterer to examine customer reactions towards menu items. Small scale surveys, formal and informal interviews with customers, customer comment cards and observations of plate waste can help to collect information on food preferences.

Sensory evaluation score cards can be used to access the food preference where the attribute of a particular food item is evaluated by the customer. This method of evaluation can be done when new menus are introduced in the food service.Observation can be done by trained observers to estimate the amount of food which is wasted and can be a simple method to access food acceptability. Another technique which is the self reported consumption pattern can also be used.

Sociocultural Factors

The values, customs and demographic characters where the food service operation functions is important because the sociocultural factors decide the products and services the customers want.

Nutritional Influences

In the present day, health issues are of great concern and the menu should be planned taking into considerations the health and nutritional needs of the customer. Food Service managers cannot ignore the nutritional needs of the customer due to increasing public awareness of the importance of nutrition and health. Nutrition and physical activity messages have to be looked upon from the dietary guidelines.With the increasing prevalence of lifestyle disorders like diabetes special menus have to be planned based on specific guidelines. Many food service operations have a nutritionist or a consultant dietitian to take care of the special needs and consumer requests for healthy items.

Aesthetic Factors

A menu should be planned with a balance of flavor, texture, color, shape and method of preparation. Foods of the same or similar flavors should not be repeated in a meal and a balance should be maintained. Similarly texture should be varied within a menu like crisp, soft, chewy and so on. The consistencies of foods like firm, runny, gelatinous have to be given among the food items in a menu.Colour has instant eye appeal and helps in sales. Appealing combination of colours like red tomatoes and green lettuce in a salad can be presented. In order to create interest in a menu, various shapes of food can be included. Food combinations including different methods of preparations usually add variety to the menu and helps in sales promotion.

The Management

From the management viewpoint, a number of factors must be considered in planning menus and the menu should be viewed as a managerial tool to control food and labour cost.

Food cost

The cost of food as purchased is termed as food cost. As menu is the major determinant of pricing food items both raw and prepared food costs should be taken into account for each menu item. For example, a forty person raw food cost is related to sales revenues in commercial food service operations. In non-commercial food service operations a daily food cost per customer is calculated and based on that the menu will be different

Production Capability

Among several resources to be considered to produce a given menu, human resource is very important. The number of working hours, number of employees, skills of the employees at a given time determines the menu items. Some menu items can be prepared in advanced and some menu items need last minute preparations. Hence based on production capability, not only that of the labour the availability of large and small equipment is also important

Type of service

Based on the type of service offered in a food service operations, the menu will be different for example a restaurant with table service will have different menu when compared to a hostel. Certain menu items require special serving equipment and with the establishment can fulfill these requirements menu suiting this condition can be planned

Availability of food

The availability of local foods, seasonal products , processed and preserved foods decide the menu to be offered at that time. The frequency of delivery of food products from various markets also decides the menu to be planned.

Price-less

Menus for private functions, pre-paid meals and the like do not have prices. In normal restaurants, there are two types of menus without prices that were mostly used until the 1970s and 1980s: the "blind menu" and the "women's menu". These menus contained all of the same items as the regular menu, except that the prices were not listed. The blind menu was distributed to guests at business meals where the hosts did not want the diners to see the prices, or to any type of dinner where the host felt that having the prices not listed would make the guests feel more comfortable ordering.

Until the early 1980s, some high-end restaurants had two menus divided by gender: a regular menu with the prices listed for men and a second menu for women, which did not have the prices listed (it was called the ladies' menu), so that the female diner would not know the prices of the items. In 1980, Kathleen Bick took a male business partner out to dinner at L'Orangerie in West Hollywood; after Bick got a women's menu without prices and her guest got the menu with prices, Bick hired lawyer Gloria Allred to file a discrimination lawsuit, on the grounds that the women's menu went against the California Civil Rights Act. Bick stated that getting a women's menu without prices left her feeling humiliated and incensed. The owners of the restaurant defended the practice, saying it was done as a courtesy, like the way men would stand up when a woman enters the room. Even though the lawsuit was dropped, the restaurant ended its gender-based menu policy. While price-less menus for women generally disappeared after the 1980s, in 2010, Tracey MacLeod reported that Le Gavroche in London (UK) still had a price-less women's menu for women who eat at tables booked by men, with tables booked by women getting a regular menu for the woman.

5.4 Economics of Menu Production

As early as the mid-20th century, some restaurants have relied on menu specialists to design and print their menus. Prior to the emergence of digital printing, these niche printing companies printed full-color menus on offset presses. The economics of full-color offset made it impractical to print short press runs. The solution was to print a "menu shell" with everything but the prices. The prices would later be printed on a less costly black-only press. In a typical order, the printer might produce 600 menu shells, then finish and laminate 150 menus with prices. When the restaurant needed to reorder, the printer would add prices and laminate some of the remaining shells.

With the advent of digital presses, it became practical in the 1990s to print full-color menus affordably in short press runs, sometimes as few as 25 menus. Because of limits on sheet size, larger laminated menus were impractical for single-location independent restaurants to produce press runs of as few as 300 menus, but some restaurants may want to place far fewer menus into service. Some menu printers continue to use shells. The disadvantage for the restaurant is that it is unable to update anything but prices without creating a new shell.

During the economic crisis in the 1970s, many restaurants found it costly to reprint the menu as inflation caused prices to increase. Economists noted this, and it has become part of economic theory, under the term menu costs. In general, such "menu costs" may be incurred by a range of businesses,

not just restaurants; for example, during a period of inflation, any company that prints catalogs or product price lists will have to reprint these items with new price figures.

began to display their menus on chalkboards, with the menu items and prices written in chalk. This way, the restaurant could easily modify the prices without going to the expense of reprinting the paper menus. A similar tactic continued to be used in the 2000s with certain items that are sensitive to changing supply, fuel costs, and so on: the use of the term market price or "Please ask the server" instead of stating the price. This allows restaurants to modify the price of lobster, fresh fish and other foods subject to rapid changes in cost.The latest trend in menus is to display them on handheld tablets; customers can browse through these and look at the photographs of the dishes.

Writing Style

An 1899 menu from Delmonico's restaurant in New York City, which called some of its selections *entremets,* and contained barely English descriptions such as plombière of marrons.The main categories within a typical menu in the US are appetizers, side orders and à la carte, entrées, desserts and beverages. Sides and à la carte may include such items as soups, salads, and dips. There may be special age-restricted sections for seniors or for children, presenting smaller portions at lower prices. Any of these sections may be pulled out as a separate menu, such as desserts and/or beverages, or a wine list. A children's menu may also be presented as a placemat with games and puzzles, to help keep children entertained.

Menus can provide other useful information to diners. Some menus describe the chef's or proprietor's food philosophy, the chef's résumé (British: CV), or the mission statement of the restaurant. Menus often present a restaurant's policies about ID checks for alcohol, lost items, or gratuities for larger parties. In the United States, county health departments frequently require restaurants to include health warnings about raw or undercooked meat, poultry, eggs, and seafood.

5.5 Puffery

As a form of advertising, the prose found on printed menus is famous for the degree of its puffery. Menus frequently emphasize the processes used to prepare foods, call attention to exotic ingredients, and add French or other foreign language expressions to make the dishes appear sophisticated and exotic. "Menu language, with its hyphens, quotation marks, and random outbursts of foreign words, serves less to describe food than to manage your expectations; restaurants are often plopping in foreign words (80 percent of them French) like spring mushroom civet, pain of rabbit, orange-jaggery gastrique.

Part of the function of menu prose is to impress customers with the notion that the dishes served at the restaurant require such skill, equipment, and exotic ingredients that the diners could not prepare similar foods at home. In some cases, ordinary foods are made to sound more exciting by replacing everyday terms with their French equivalents. For example, instead of stating that a pork chop has a dollop of apple sauce, a high-end restaurant menu might say Tenderloin of pork *avec compote de Pommes*. Although *avec compote de Pommes*translates directly as with apple sauce, it sounds more exotic—and more worthy of an inflated price tag. Menus may use the culinary terms *concassé* to describe coarsely chopped vegetables, *coulis* to describe a purée of vegetables or fruit, or *au jus*, to describe meat served with its own natural gravy of pan drippings.

Types

City Hotel, New Orleans restaurant menu (December 8, 1857)Savoy Hotel in Cairo, menu from 1900.Menus vary in length and detail depending on the type of restaurant. The simplest hand-held menus are printed on a single sheet of paper, though menus with multiple pages or views are common. In some cafeteria-style restaurants and chain restaurants, a single-page menu may double as a disposable placemat. To protect a menu from spills and wear, it may be protected by heat-sealed vinyl page protectors, lamination or menu covers. Restaurants consider their positioning in the marketplace (e.g. fine dining, fast food, informal) in deciding which style of menu to use.

Some restaurants use a single menu as the sole source of information about the food for customers, but in other cases, the main menu is supplemented by ancillary menus, such as:

- An appetizer menu (nachos, chips and salsa, vegetables and dip, etc.)
- A wine list
- A liquor and mixed drinks menu
- A beer list
- A dessert menu (which may also include a list of tea and coffee options)

Some restaurants use only text in their menus. In other cases, restaurants include illustrations and photos, either of the dishes or of an element of the culture which is associated with the restaurant. For instance a Lebanese kebab restaurant might decorate its menu with photos of Lebanese mountains and beaches. Particularly with the ancillary menu types, the menu may be provided in alternative formats, because these menus (other than wine lists) tend to be much shorter than food menus. For example, an appetizer menu or a dessert menu may be displayed on a folded paper table tent, a hard plastic table

stand, a flipchart style wooden table stand, or even, in the case of a pizza restaurant with a limited wine selection, a wine list glued to an empty bottle.

Take-out restaurants often leave paper menus in the lobbies and doorsteps of nearby homes as advertisements. The first to do so may have been New York City's Empire Szechuan chain, founded in 1976. The chain and other restaurants' aggressive menu distribution in the Upper West Side of Manhattan caused the Menu Wars of the 1990s, including invasions of Empire Szechuan by the Menu Vigilantes, the revoking of its cafe license, several lawsuits, and physical attacks on menu distributors.

Menu Board

Some restaurants – typically fast-food restaurants and cafeteria-style establishments – provide their menu in a large poster or display board format up high on the wall or above the service counter. This way, all of the patrons can see all of the choices, and the restaurant does not have to provide printed menus. This large format menu may also be set up outside (see the next section). The simplest large format menu boards have the menu printed or painted on a large flat board. More expensive large format menu boards include boards that have a metal housing, a translucent surface, and a backlight (which facilitates the reading of the menu in low light) and boards that have removable numbers for the prices. This enables the restaurant to change prices without having to have the board reprinted or repainted.

Some restaurants such as cafes and small eateries use a large chalkboard to display the entire menu. The advantage of using a chalkboard is that the menu items and prices can be changed; the downside is that the chalk may be hard to read in lower light or glare, and the restaurant has to have a staff member who has attractive, clear handwriting.A high-tech successor to the chalkboard menu is the 'write-on wipe-off" illuminated sign, using LED technology. The text appears in a vibrant color against a black background.

Outdoor

Some restaurants provide a copy of their menu outside the restaurant. Fast-food restaurants that have a drive-through or walk-up window will often put the entire menu on a board, lit-up sign, or poster outside so that patrons can select their meal choices. High-end restaurants may also provide a copy of their menu outside the restaurant, with the pages of the menu placed in a lit-up glass display case; this way, prospective patrons can see if the menu choices are to their liking. Also, some mid-level and high-end restaurants may provide a partial indication of their menu listings–the specials–on a

chalkboard displayed outside the restaurant. The chalkboard will typically provide a list of seasonal items or dishes that are the specialty of the chef which is only available for a few days.

Digital displays

With the invention of LCD and Plasma displays, some menus have moved from a static printed model to one which can change dynamically. By using a flat LCD screen and a computer server, menus can be digitally displayed allowing moving images, animated effects and the ability to edit details and prices.For fast food restaurants, a benefit is the ability to update prices and menu items as frequently as needed, across an entire chain. Digital menu boards also allow restaurant owners to control the day parting of their menus, converting from a breakfast menu in the late morning. Some platforms support the ability allow local operators to control their own pricing while the design aesthetic is controlled by the corporate entity. Various software tools and hardware developments have been created for the specific purpose of managing a digital menu board system. Digital menu screens can also alternate between displaying the full menu and showing video commercials to promote specific dishes or menu items.

Online Menu

Websites featuring online restaurant menus have been on the Internet for nearly a decade. In recent years, however, more and more restaurants outside of large metropolitan areas have been able to feature their menus online as a result of this trend.Several restaurant-owned and startup online food ordering websites already included menus on their websites, yet due to the limitations of which restaurants could handle online orders, many restaurants were left invisible to the Internet aside from an address listing. Multiple companies came up with the idea of posting menus online simultaneously, and it is difficult to ascertain who was first. Menus and online food ordering have been available online since at least 1997. Since 1997, hundreds of online restaurant menu web sites have appeared on the Internet. Some sites are city-specific, some list by region, state or province.

Digital Menu

The idea of the digital menu is very new and differs from an online menu. An online menu is a website presenting a food menu on an e-commerce platform but has no interface with meal production except sometimes receiving the order. A digital menu is a fully integrated food menu where the front-end is presented online as a web application, but as well as facilitating orders it is also linked to the kitchen or other production facility. A digital menu can generate a variety of reports and is connected with the finance/point of sale system. It may also be integrated with inventory and accounting software.

Secret Menu

Another phenomenon is the so-called secret menu where some fast food restaurants are known for having unofficial and unadvertised selections that customers learn by word of mouth, or by looking them up online. Fast food restaurants will often prepare variations on items already available, but to have them all on the menu would create clutter. This can also occur in high-end restaurants, which may be willing to prepare certain items which are not listed on the menu (e.g., dishes that have long been favorites of regular clientele). Sometimes restaurants may name foods often ordered by regular clientele after them, for either convenience or prestige. At some fast food restaurants, secret menu' items exist which were once part of the regular menu but are no longer advertised. These items may still be rung up as a regular menu item, and are assembled from ingredients that are still in use in other menu items.

Harvesting fruits and vegetables from your garden at the proper stage of maturity is only the first step to fresh table quality. Proper harvesting and post-harvest handling methods, as well as proper storage of fruits and vegetables not immediately eaten, will help maintain the flavor, texture and nutritive value of the produce.Proper storage means controlling both the temperature and relative humidity of the storage area. All fruits and vegetables do not have the same requirements. This NebGuide will help you select the best storage conditions for homegrown and purchased produce.

5.6 Pre-Harvest Considerations

Food safety recommendations state raw manure applications must be made a minimum of 120 days prior to harvest for any produce where the edible portion is in direct contact with the soil and 90 days prior to harvest if the edible portion is not in direct contact with the soil. Guidelines differ for composted manure applications. Plant based compost is not considered raw manure.Food safety is also a concern when flooding occurs in a vegetable garden. Remove and destroy produce if the edible portion is in contact with floodwaters.Follow all label directions regarding post-harvest intervals when pesticide applications are made before harvesting produce. A post-harvest interval is the number of days produce must remain in the garden allowing breakdown of the pesticides to occur before produce is harvested.

Harvest Methods and Post-Harvest Care

Most fruits and vegetables are easily bruised if not handled carefully. When harvesting, treat produce as if it were fine china. Tossing fruits and vegetables into baskets or boxes may not leave visible bruises and damage, but decay will begin under the skin. Seemingly sturdy vegetables such as sweet

potatoes are actually quite tender and will not store well if bruised.Best practices for food safety encourages the use of washable containers when harvesting and during storage of produce.

Not all produce should be washed upon harvest but always use potable water if produce is washed. Berries, for example, are very delicate and fragile. Rinse them in cold water just before consuming, as prior washing will cause them to break down and turn mushy. Potatoes store better if they have a fine layer of soil left on the skin to reduce moisture loss and prevent the infestation of water-borne bacteria or fungi. Water can transport bacteria and fungi into the pores of fruits and vegetables as well, reducing viable storage time.

Some produce, however, is washed and dried before storing. Commercial packing houses use sanitizers in the packing line water to kill fungi, bacteria and yeast that might otherwise cause spoilage. Sodium hypochlorite (liquid bleach) is the most readily available of these sanitizers. Excessive use of hypochlorite can result in off-flavors, tissue damage and may change the surface pH of the produce, encouraging microbial growth. Therefore, it is important to use only the recommended amount of bleach in the wash water when cleaning produce. Cool produce before washing and use wash water no more than 10 degrees cooler than the fruits. Do not allow produce to soak in wash water. This helps prevent the movement of bacteria and sanitizers into the fruits during washing.

Curing Vegetables to Improve Shelf-life

Several vegetables benefit from post-harvest curing. Curing heals or suberizes injuries from harvesting operations. It thickens the skin, reducing moisture loss and affording better protection against insect and microbial invasion. Curing is usually accomplished at an elevated storage temperature and high humidity.

In Home Storage

Produce can be cured in home storage areas. Temperature and humidity should be managed as accurately as possible, especially in outdoor locations. A space heater in an enclosed area can provide the needed heat for curing. Humidity can be increased by over-laying containers with sheets of plastic. Plastic bags, lined boxes, metal or plastic cans with lids or crocks also increase humidity around the stored produce. A humidifier will maintain humidity in an otherwise dry storage location. Or maintain moisture around produce by storing it in damp sand, sawdust, or peat moss. Use these materials for one storage season only, then use them as mulch or a soil amendment in the garden. They may accumulate mold or bacteria and reduce produce storage time if used more than one season.

Ensure that temperature is closely monitored, especially in outdoor locations. Place the produce in peat moss to help keep the humidity high. Do not store produce directly below raw meats to prevent contamination from food pathogens.Check stored produce periodically throughout the winter for signs of decay or growth. Remove decaying produce from the storage area immediately to reduce the chance of decay in other products stored nearby.Specifics for curing and storage of different types of vegetables are listed below.

In Garden Storage

Root crops such as beets, carrots, rutabagas, parsnips and turnips can be left in the garden into late fall and early winter. A heavy mulch of straw will help prevent the ground from freezing so the roots can be dug when needed. The mulch will also maintain the quality of the roots, as it will reduce repeated freezing and thawing of the vegetables. Many people prefer the taste of these root crops after they have been frosted because their flavors become sweeter and milder.When temperatures drop low enough to freeze the ground under the mulch, finish harvesting the roots. Cut off all but one-half inch of the top and store at 32° to 40°F in high humidity to reduce shriveling.

5.7 Recommended Handling of Specific Vegetables and Fruits

Irish Potatoes

Late-crop potatoes are better for long-term storage than early potatoes since outdoor temperatures are usually lower when they are harvested. After harvest, cure late potatoes by holding them in moist air for 1 to 2 weeks at 60 to 75°F. Wounds will not heal at 50°F or below. After curing, lower the storage temperature to about 40–45°F. Potatoes will keep even longer at 35–40°F but at 35°F, potatoes tend to become sweet. This condition can be corrected by holding the potatoes at about 70°F for a week or two before you use them.Potatoes will keep well for several months in a cool basement or cellar. They keep best in moderately moist air, which helps prevent shriveling. Do not wash potatoes before they are put into storage.Store potatoes in the dark; exposure to light causes them to turn green. The green pigment contains the toxic alkaloid solanine. Green sections of potatoes should be removed before cooking.

Onions

Harvest onions when the tops have fallen over and begun to dry. Do not bend over the tops during the growing season to “force the energy into the bulb”. This practice reduces the growth of the onions as they will not be able to translocate sugars to the bulb for storage.

Commercially, onions are dug, windrowed and allowed to cure in the field before they are picked up. Home gardeners should cure onions after harvest by spreading them in a single layer on screens in the shade or in a well-ventilated garage or shed for 1 to 2 weeks or until the tops are completely dry and shriveled. If the bulbs are exposed to full sun, prevent sunscald by covering with a light-weight cloth. When the tops are dry, they should be trimmed to 1 inch lengths, however if the onions are to be braided for storage the tops can be left attached. Leave the onion‘s dry outer skins on; they help reduce bruising, shrinking and act as an insect barrier.

Store onions in shallow boxes, mesh bags or hang them in old nylons in a cold, dry, well-ventilated room. Or braid the leaves of onions for hanging and storage. Temperatures close to 32°F will give the longest storage. Products prone to absorb odors or flavors should not be stored close to onions.

Sweet and Hot Peppers

Mature, green bell peppers can be kept for 2 or 3 weeks if handled properly. Firm, dark-green peppers free of blemishes and injury are best for storage.To prevent chilling injury, pick peppers just before frost or before frost threatens if daytime temperatures are consistently below 45°F. Wash them with water containing 1 1/2 tsp. of chlorine bleach per gallon of water. Dry and sort according to maturity and firmness. Store peppers in boxes lined with plastic or in plastic bags, which have several 1/4” holes punched in them to maintain high humidity. The temperature should be between 45 and 50°F. Fully mature green peppers may turn red during storage, which does not affect the flavor of the peppers.

Hot chile peppers are easiest to store after they are dry. One exception is habanero or Scotch bonnet type peppers. These do not dry well except in a dehydrator. Peppers can be dried by either pulling the plants and hanging them upside down or by picking the peppers from the plants and stringing together. Ripe chili peppers can be dried in a forced air dehydrator, but it is usually not necessary to do so.

Tomatoes

With care, mature green tomatoes will keep and ripen for about 4 to 6 weeks in the fall. Some cultivars have been developed for even longer storage. Tomatoes from nearly spent vines are more subject to decay and are usually not as good as those from vigorous vines. A late planting of tomatoes will provide vigorous vines from which fruit can be harvested for storage.Harvest tomatoes just before the first killing frost. If an unexpected frost occurs, undamaged fruits can be salvaged and ripened. Prevent chilling injury to the fruit by harvesting everything when temperatures drop regularly to 32° to 50°F.

To store, pick the tomatoes and remove the stems. Reduce rots by disinfecting fruits by washing in water with 1 1/2 teaspoons of chlorine bleach per gallon of water. Dry thoroughly with a soft cloth.Pack tomatoes 1 or 2 layers deep in shallow boxes. Reduce bruising by separating those showing red; they will ripen sooner and can be used first.

Pumpkins and Winter Squash

Harvest mature fruit with hard rinds before frost. Leave the stem on when cutting from the plants to prevent decay organisms from entering. Pumpkins and winter squash will keep best if they are cured for 10 days at 80–85°F. Acorn squash, however, should not be cured but stored at 45°F to prevent stringiness.

Apples

Many cultivars of apples store moderately well under home storage conditions for up to six months. Late maturing varieties are best suited to storage. These apples can be stored in baskets or boxes lined with plastic to help retain moisture. Always sort apples carefully and avoid bruising them. The saying "one bad apple spoils the barrel" is true because apples give off ethylene gas which speeds ripening. When damaged, ethylene is given off more rapidly and will hasten the ripening of other apples in the container. Because of their sugar content, apples can be stored at 30–32°F without freezing the tissue. In general, apples ripen about four times as fast at 50°F as at 32°F, so they should be kept as close to 32°F as possible for long-term storage.Apples often pass their odor or flavor to more delicately flavored produce and the ethylene given off by apples can accelerate ripening in other crops. When possible, store apples separately.

Pears

For good flavor and texture, pears, except for 'Seckel' must be ripened after harvest. Pick pears when they are fully mature. Fruit is ready to harvest while it is quite firm but the color has lightened to a pale green. It should part easily from the branch when you lift up on the fruit and twist. Pears left to ripen on the tree tend to become grainy or stringy. The center also may turn brown before the exterior shows deterioration.Pears ripen quickly after harvest when held at 60 to 65°F. Ripening will take 1 to 3 weeks, depending on the type of pear. After ripening, pears should be canned or preserved. To keep pears longer in storage, sort for defects after picking and place sound fruit into cold storage at 29–31°F and 90% humidity. Ripen small amounts as needed, by moving them to a warmer location, 60–65°F. Too high of temperatures (75°F and higher) will cause the fruit to break down without ripening.

5.8 Storage of Fruits and Vegetables

Proper marketing of perishable commodities such as fruits and vegetables often requires some storage to balance day-to-day fluctuations between harvest and sale for long-term storage. Storage improves commodities quality, and usefulness and also controls a market glut. The principal goal of storage is to control the rate of transpiration, respiration, disease and insect infestation. Storage life can be prolonged by harvesting at proper maturity, control of post-harvest diseases, regulation of the atmosphere, chemical treatments, irradiation, refrigeration and controlled and modified atmosphere.

The main goals of storage are:

- Slow the biological activity without chilling injury
- Slow the growth of micro-organisms.
- Reduce transpiration loss.

The factors which need to be taken into account before embarking on crop storage are:

- Knowledge of the appropriate storage conditions
- Cultivar or a variety of crops suitable for storage
- Availability of appropriate storage facilities
- Availability of suitable management.

Fruits and vegetables are living organisms. Their condition and marketable life will deteriorate during storage through—

1) Loss of moisture

2) Loss of stored energy—carbohydrates

3) Loss of other foods

4) Physical losses through pest and disease attack

5) Loss in quality from physiological disorders, Fibreness (asparagus) Greening (potatoes) Rooting (due to increased humidity) Shoot growth and elongation (Asparagus, Carrot, Beet) Seed germination Fruit growth Sprouting (potatoes, onion, ginger, garlic) Toughening (due to high-temperature beans and sweet corn)

Factors Affecting Storage:

a) Temperature

b) Relative humidity

c) Air velocity

d) Atmosphere composition

e) Light

f) Storage operations

Methods of Storage:

Mainly there are two methods of storage i.e. traditional methods and advanced methods.

a) Traditional methods (Low-cost storage structures) not requiring refrigeration include: in situ, sand, coir, pits, clamps, windbreaks, cellars, barns, evaporative cooling, and night ventilation:

b) In situ.

This method of storing fruits and vegetables involves delaying the harvest until the crop is required. It can be used in some cases with root crops, such as cassava, but means that the land on which the crop was grown will remain occupied and a new crop cannot be planted. In colder climates, the crop may be exposed to freezing and chilling injury. In some commodities development of undesirable fibre and starch occurs. There are chances of occurring damage due to insect pests and diseases.

c) Sand or coir:

This storage technique is used in countries like India to store potatoes for longer periods of time, which involves covering the commodity underground with sand.

d) Pits or Trenches:

These are dug 1.0-1.5m deep at the edges of the field where the crop has been grown. Usually, pits are placed at the highest point in the field, especially in regions of high rainfall. The pit or trench is lined with straw or other organic material and filled with the crop being stored, then covered with a layer of organic material followed by a layer of soil. Holes are created with straw at the top to allow for air ventilation, as lack of ventilation may cause problems with the rotting of the crop. This method is suitable for storing ginger. This method is not suitable for fruits and leafy vegetables demanding high humidity because it cannot maintain high humidity. The stored commodity can not be examined frequently for rotting etc.

e) Clamps.

This has been a traditional method for storing potatoes, cassava etc. In some parts of the world, such as Great Britain. A common design uses an area of land at the side of the field. The width of the clamp is about 1 to 2.5 m. The dimensions are marked out and the potatoes are piled on the ground in an elongated conical heap. Sometimes straw is laid on the soil before the potatoes. The central height of the heap depends on its angle of repose, which is about one-third the width of the clump. At the top, the straw is bent over the ridge so that rain will tend to run off the structure. The straw thickness should be from 15-25 cm when compressed. After two weeks, the clamp is covered with soil to a depth of 15-20 cm, but this may vary depending on the climate. Produce may desiccate because of low relative humidity. Large heaps may result in more incidence of rotting.

f) Windbreaks are constructed by driving wooden stakes into the ground in two parallel rows about 1 m apart. A wooden platform is built between the stakes about 30 cm from the ground, often made from wooden boxes. Chicken wire is affixed between the stakes and across both ends of the windbreak. This method is used in Britain to store onions.

(g) Cellars.

These underground or partly underground rooms are often beneath a house. This location has good insulation, providing cooling in warm ambient conditions and protection from excessively low temperatures in cold climates. Cellars have traditionally been used on a domestic scale in Britain to store apples, cabbages, onions, and potatoes during winter. Produce may desiccate due to low relative humidity.

(h) Barns.

A barn is a farm building for sheltering, processing, and storing agricultural products, animals, and implements. Although there is no precise scale or measure for the type or size of the building, the term barn is usually reserved for the largest or most important structure on any particular farm. Smaller or minor agricultural buildings are often labelled as sheds or outbuildings and are normally used to house smaller implements or activities.

(i) Evaporative Cooling.

When water evaporates from the liquid phase into the vapour phase energy is required. This principle can be used to cool stores by first passing the air introduced into the storage room through a pad of water. The degree of cooling depends on the original humidity of the air and the efficiency of the evaporating surface. If the ambient air has low humidity and is humidified to around 100% RH, then a large reduction in temperature will be achieved. This can provide cool moist conditions during storage.

(j) Zero energy cool chamber (ZECC):

It is a low-cost storage structure suitable for short-duration storage of fruits and vegetables There is no need for any power source i.e. electricity, diesel, petrol etc. for cooling, thus, the name zero energy cool chamber. The zero-energy cool chamber is based on the evaporative cooling system. Evaporation occurs when air that is not already saturated with water is blown across any wet surface. Thus an evaporative cooler consists of a wet porous bed through which air is drawn, cooled and humidified by the evaporation of water. In summer, when the outside temperature is 44 degree C, the maximum temperature inside the chamber never goes beyond more than $28^{O}C$, the relative humidity being 90% .

(k) Night Ventilation.

In hot climates, the variation between day and night temperatures can be used to keep stores cool. The storage room should be well insulated when the crop is placed inside. A fan is built into the store room, which is switched on when the outside temperature at night becomes lower than the temperature within. The fan switches off when the temperatures equalize. The fan is controlled by a differential thermostat, which constantly compares the outside air temperature with the internal storage temperature. This method is used to store bulk onions.

l) Controlled atmospheres are made of gastight chambers with insulated walls, ceiling, and floor. They are increasingly common for fruit storage at a larger scale. Depending on the species and variety, various blends of O_2, CO_2, and N_2 are required. Low-content O_2 atmospheres (0.8 to 1.5%), called ULO (Ultra-Low Oxygen) atmospheres, are used for fruits with long storage lives (e.g., apples).

II. Advanced (high-cost) Methods of Storage:

1. Low-temperature storage (Refrigerated or cold storage):

Microbial growth and enzyme reactions are retarded in food storage at low temperatures. The lower the temperature, the greater the retardation. Low temperatures employed can be

a) Cellar storage temperature (about 15 degree C)

b) Refrigeration or chilling temperature (0-5 degree C)

c) Freezing temperature (Cold storage) (-18 to -40 degree C)

(a) Cellar storage temperature (about 15 degree C):

The temperature in cellar (underground rooms) where food is stored in many villages are usually not much below that of the outside air and is seldom lower than 15 degree C. The temperature is not low enough toprevent the action of many spoilage organisms and of plant enzymes. Decomposition is however slowed down considerably. Root crops, potatoes, onions, apples and similar foods can be stored for a limited during the winter months.

(b) Refrigeration or chilling temperatures (0-5 degree C):

Refrigerated storage or low-temperature storage is the most common method of storage throughout the world both for fruits and vegetables. Refrigeration is the process of removing heat from an enclosed space or room or a substance or commodity. The primary purpose of refrigeration is to lower the temperature of the enclosed space or substance or commodity and then maintain that lower temperature.

(c) Cold storage:

At temperatures below the freezing point of water (-18 to -40 degree C) growth of microorganisms and enzyme activity are reduced to the minimum. Most perishable foods can be preserved for several months if the temperature is brought down quickly (called quick freezing) and food is held at these temperatures. Foods can be quickly frozen in about 90 minutes or less by placing them in contact with the coil through which the refrigerant flows (2) through blast freezing in which cold air is blown across the food, (3) by dipping in liquid nitrogen.

Quick-frozen foods maintain their identity and freshness when they are thawed (brought to room temperature) because very small crystals are formed when foods are frozen by these methods. Many microorganisms can survive this treatment and may become active and spoil the food if the foods are held at higher temperatures. Frozen foods should always, therefore be held at temperatures below -5^{O}C. Enzymes in certain vegetables can continue to act even after being quickly frozen and so vegetables have to be given heat treatment called blanching(above 80 degree C) before they are frozen to prevent the development of off flavours.

(2) Controlled/Modified Atmosphere Storage:

In this system, the product is held under atmosphere conditions modified by package, overwrap, box liner or pellet cover. The first requirement of CAS is sufficiently gas-tight envelops around the product and the second requirement is some means of maintaining the concentration of CO_2 and O_2 at the desired level. This method in combination with refrigeration markedly enhanced the storage life of fruits. The fruit that has derived the most benefit is the apple. Among the tropical fruits, the best atmosphere for storage of mangoes is 5% CO_2 and 5% O_2 at 13 degree C. CAS improved the appearance of pine apple fruit by reducing the superficial mould growth. The optimum O_2 level was 2%. Levels of oxygen below that were ineffective in extending storage life. Benefits could be obtained with papaya when the fruits are stored in 5% CO_2 and 1 % O_2 for 3 weeks at 13^{o}C. Initiation of ripening in banana can be delayed for weeks or months by holding the green banana fruits in an atmosphere of 1-10% O_2, 5-10% CO_2 or low O_2 and high CO_2 combination, In general, the response of citrus fruits to CAS has been disappointing. In MAS the composition of the storage atmosphere is not closely controlled.

(3) Hypobaric (Sub atmosphere) Storage:

The commodity is placed in a vacuum-tight and refrigerated container and evacuated by a vacuum pump to the desired low pressure. The process of ripening and senescence are greatlyretarded by

decreasing respiration and evacuation of ethylene given out by the poduce. This is an expensive method.

(4) Irradiation: The application of irradiation for suppressing sprouting and hence the extension of shelf life has been allowed in India. Sprouting onion can be checked by gamma irradiation at a dose of 0.06 - 0.1 kGY. In potato gamma irradiation at -0.1 kGY can inhibit sprouting completely. The irradiated potatoes could be stored successfully for 6 months at 15^{O}C with 10% loss. Irradiation in banana, guava, mango and papaya improves shelf life due to delay in rate of ripening and senescence.

Kitchens began as simple hearths, evolving over centuries into separated rooms where food prep took place. By the 1900s, with advances in plumbing and appliances, they became more functional and organized. The mid-20th century saw popularization of the "work triangle" concept, emphasizing efficiency between the stove, sink, and refrigerator. As lifestyles shifted, open layouts emerged, connecting kitchens to living spaces. From wood-fired stoves in communal settings to modular designs in private homes, kitchen layouts have always reflected society's changing needs and technological progress.Kitchens, equipped with essential fixtures such as counters, cabinets, appliances (oven, refrigerator, dishwasher), and often an island or breakfast bar, serve as the heart of a home. Kitchen layouts are designed considering the "work triangle" concept, which connects the three primary work areas: the stove, sink, and refrigerator.

The goal is to facilitate easy movement and efficient cooking. Depending on the space, kitchens can be U-shaped, L-shaped, galley, or open plan, among other styles. Additional features might include a pantry for storage or a dining nook for casual meals. Each layout aims to blend functionality, flow, and aesthetics. As homes change, so do kitchen layouts. Modern trends lean towards open-plan designs, integrating living spaces for more family interaction and entertaining. Smart technology brings voice-controlled appliances and touch-free faucets, making kitchens more intuitive. With urban living on the rise, space efficiency is key, pushing for multi-functional islands and retractable units. Sustainable materials and energy-efficient appliances cater to eco-conscious homeowners.

Yet, challenges arise: ensuring kitchens remain heartful spaces amidst tech integration, and accommodating diverse cooking habits in increasingly compact urban homes. Regardless, the kitchen's evolution will prioritize usability, comfort, and environmental considerations.

5.9 What are the factors to consider when planning a kitchen layout?

The first factor to consider is the available space and intended use of that space as all people cook and use kitchens differently. After, comes placement of necessary appliances such as a dishwasher, refrigerator, and sink. Between these appliances, specific areas should be designated to indicate prepping, cooking, baking, and to organize tools among these zones. Other important factors include the availability of a work surface, efficient storage, and quality lighting.

How do you design a small kitchen?

A single row or one-wall kitchen is considered the most suitable layout for a small kitchen. All necessary equipment and storage can be found in this design although it is noted to be lacking in sufficient counter space. A kitchen cart with the top surface used as a butcher block can be an efficient addition. An L-shaped layout is another option for designing a kitchen within a small space by maximizing the use of a corner. In both cases, the opposite empty wall can feature a table that can fold down when not in use.

What is modular kitchen design?

Modular kitchen design features small modules that together, form a kitchen that increases space, storage, and efficiency. The layout of a modular kitchen can be broken down into set sections and as such, make for easy installation and repetition in production. For example, a modular kitchen cabinet is a stand alone and pre-made element that can enhance functionality for the user by meeting individual needs.

Fuel-management systems

Fuel-management systems are used to maintain, control and monitor fuel consumption and stock in any type of industry that uses transport, including rail, road, water and air, as a means of business. Fuel-management systems are designed to effectively measure and manage the use of fuel within the transportation and construction industries. They are typically used for fleets of vehicles, including railway vehicles and aircraft, as well as any vehicle that requires fuel to operate. They employ various methods and technologies to monitor and track fuel inventories, fuel purchases and fuel dispensed. This information can be then stored in computerized systems and reports generated with data to inform management practices. Online fuel management is provided through the use of web portals to provide detailed fueling data, usually vis a vis the back end of an automated fuel-management system. This enables consumption control, cost analysis and tax accounting for fuel purchases.

There are several types of fuel-management systems. Card-based fuel-management systems typically track fuel transactions based on a fueling credit card and the associated driver PIN. Reports can then be

generated based on fuel consumption by driver, and data can be directly downloaded. On-site fuel-management systems may employ fleet refueling services or bulk fuel tanks at the site. Fuel is tracked as it is pumped into vehicles, and on-site storage levels can be managed.

Some fuel companies offer total fuel-management systems whereby they provide elements of a card-based system along with on-site fuel delivery and refueling services. Mobile fuel management refers to a fleet of fuel trucks or tankers which provide fuel supply to commercial fleets of trucks or construction equipment. May involve combining technology to identify equipment and automated fuel management to append the details of each transaction to a unique piece of equipment. By refueling vehicles in the evening when they are not in use, the company can conserve man-hours as the operators do not refuel and the vehicles do not require additional fuel to travel to the refueling station. They may also employ more sophisticated systems that utilize remote data collection to gather specific technical information about the vehicle usage and performance characteristics such as mileage, hours of operation and engine idling time.

The increasing use of bio-fuel has introduced another challenge in fuel management. With greater water content, there will be a risk of microbial growth – depending on the storage conditions, the fuel quality will deteriorate over time, leading to clogged filters and loss of productivity.Tank manufacturers have introduced fuel filtering and cleansing packs which recirculate the tank contents through a series of filters and ultraviolet treatment to kill bacteria. Data from fuel quality instrumentation can be streamed to allow remote monitoring over internet connections.

5.10 Waste Disposal

We observe heaps of garbage lying along the roads while passing through a highway. Open dumping is the most common method of waste disposal in India.The trash heaps are usually left open to the environment and the elements. These seldom have a sparse covering which can often attract pests or vermin.Sometimes, these dumps are subjected to open burning, which can release toxic fumes and smokes. There have also been instances where enough heat has been generated to trigger a spontaneous combustionSometimes, wastes are illegally dumped into rivers and canals or used to fill land depressions without proper consultations. These practices cause a lot of problems in the long run. These can range from the degradation of the soil quality to leaching toxic chemicals into underground water sources. Therefore, to prevent such scenarios, proper waste disposal methods should be adopted.

5.10.1 Methods of Waste Disposal

Garbage accumulation has never been much of a concern in the past, but due to globalization and industrialization, there is a need for a more efficient waste disposal method. Following are some of the methods that are used today.

Fig: Methods of wastes disposal

Landfill

In this process, the waste that cannot be reused or recycled are separated out and spread as a thin layer in low-lying areas across a city. A layer of soil is added after each layer of garbage. However, once this process is complete, the area is declared unfit for construction of buildings for the next 20 years. Instead, it can only be used as a playground or a park.

Incineration

Incineration is the process of controlled combustion of garbage to reduce it to incombustible matter such as ash and waste gas. The exhaust gases from this process may be toxic, hence it is treated before being released into the environment. This process reduces the volume of waste by 90 per cent and is considered as one of the most hygienic methods of waste disposal. In some cases, the heat generated is used to produce electricity. However, some consider this process, not quite environmentally friendly due to the generation of greenhouse gases such as carbon dioxide and carbon monoxide.

Waste Compaction

The waste materials such as cans and plastic bottles are compacted into blocks and sent for recycling. This process prevents the oxidation of metals and reduces airspace need, thus making transportation and positioning easy.

Biogas Generation

Biodegradable waste, such as food items, animal waste or organic industrial waste from food packaging industries are sent to bio-degradation plants. In bio-degradation plants, they are converted to biogas by degradation with the help of bacteria, fungi, or other microbes. Here, the organic matter serves as food for the micro-organisms. The degradation can happen aerobically (with oxygen) or anaerobically (without oxygen). Biogas is generated as a result of this process, which is used as fuel, and the residue is used as manure.

Composting

All organic materials decompose with time. Food scraps, yard waste, etc., make up for one of the major organic wastes we throw every day. The process of composting starts with these organic wastes being buried under layers of soil and then, are left to decay under the action of microorganisms such as bacteria and fungi.This results in the formation of nutrient-rich manure. Also, this process ensures that the nutrients are replenished in the soil. Besides enriching the soil, composting also increases the water retention capacity. In agriculture, it is the best alternative to chemical fertilizers.

5.11 Vermicomposting

Vermicomposting is the process of using worms for the degradation of organic matter into nutrient-rich manure. Worms consume and digest the organic matter. The by-products of digestion which are excreted out by the worms make the soil nutrient-rich, thus enhancing the growth of bacteria and fungi. It is also far more effective than traditional composting.

5.12 Summary

Under this unit we have summarized the about menu planning, puffery, storage of fruits & vegetables, wastes disposal and vermincomposting etc. Menu planning in food service helps the chef take charge of the kitchen, keep a tab on available ingredients, and help the restaurant make a profit. A menu is a detailed list of options offered to the customer when they come to eat or drink at the restaurant or bar. They offer a wide variety of choices, and are priced differently based on the ingredients used, time taken to cook the dishes, or the season and availability of ingredients used. Menus can be different based on the meals of the day, such as breakfast, lunch, and dinner. Meal planning is important because it helps to know in advance

the time taken to cook the recipes, have the ingredients, know the likes and dislikes of the people eating the meals, and the days and times they'd be available to eat them. Besides, one of the biggest reasons why it is important is because it saves time, money, and space in the kitchen pantry. It also helps prepare healthy, well-thought-out meals for the family.

There is scope to control storage life and quality of produce through postharvest management of the two most important determinants: respiration and transpiration. Both need to be limited but not stopped and proper control of temperature and relative humidity is the key to maximizing storage life and marketable quality. Produce quality loss after harvest happens as a result of physical, biochemical, physiological and biological procedures, the rates of which are influenced primarily by product temperature at harvesting and relative humidity surrounding the produce. Fresh produce needs low temperature and high relative humidity during storage.

5.13 Terminal questions

Q. 1 What do you mean by economics of menu production? Explain it.

Answer:----------

Q. 2 What are the factors to consider for planning a kitchen layout. Describe it.

Answer:----------

Q. 3 Describe the factors affecting menu planning.

Answer:----------

Q. 4 Write short notes on the following.

(a) Waste disposal

(b) Vermicomposting

Answer:----------

Q. 5 Describe the recommended handling of specific vegetables and fruits.

Answer:----------

Q. 6 Write a short note on methods of waste disposal.

Answer:----------

Q. 7 Describe various methods of waste disposal.

Answer:----------

Further readings

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

Unit- 6: Production Planning and Quantity Food Production

Structure

Objectives

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Further readings

6.1 Introduction

Food production, as the name suggests, is all about preparing food, in which raw materials are converted into ready-made food products for human use either in the home or in the food processing industries. Its process comprises scientific approaches. Food production has many sections and it starts with basic things like cleaning, packing, segregating, sorting, preparing, adding ingredients in correct proportions, presenting, etc.Let us explore food production notes to learn how the food is produced and what are the methods involved in the production of food.

There are large numbers of plant and animal products, which are used for our well-being. They provide us with food, which comes from both plants and animals. These include grains, pulses, spices, honey, nuts, cereals, milk, vegetables, fruits, egg, meat, chicken, etc. The existence of our life is completely depended on plants and animals. Altogether, plant and animal species provide 90% of global energy. Food production is an important element in a food service operation. The expectations of a customer can be satisfied only through tasty and good food which in turn can be achieved through food production. Hence the heart of any food service operation is the food production department.

Objectives

This is the sixth unit **(**Production planning and quantity food production**)** of second block (Preparation and Quality Evaluation of Biscuits and Menu Planning and Food Facilities). After studying this unit, you will be able to:

- To introduce the concepts of menu board, outdoor and displays
- To discuss online menu, digital menu and secret menu
- To know the importance of menu planning and food safety with hygiene
- To discuss food cross-contamination and causes of food spoilage

6.2 Types

Menus vary in length and detail depending on the type of restaurant. The simplest hand-held menus are printed on a single sheet of paper, though menus with multiple pages or "views" are common. In some cafeteria-style restaurants and chain restaurants, a single-page menu may double as a disposable placemat. To protect a menu from spills and wear, it may be protected by heat-sealed vinyl page protectors, lamination or menu covers. Restaurants consider their positioning in the marketplace (e.g. fine dining, fast food, informal) in deciding which style of menu to use. Some restaurants use a single

menu as the sole source of information about the food for customers, but in other cases, the main menu is supplemented by ancillary menus, such as:

- An appetizer menu (nachos, chips and salsa, vegetables and dip, etc.)
- A wine list
- A liquor and mixed drinks menu
- A beer list
- A dessert menu (which may also include a list of tea and coffee options)

Some restaurants use only text in their menus. In other cases, restaurants include illustrations and photos, either of the dishes or of an element of the culture which is associated with the restaurant. For instance a Lebanese kebab restaurant might decorate its menu with photos of Lebanese mountains and beaches. Particularly with the ancillary menu types, the menu may be provided in alternative formats, because these menus (other than wine lists) tend to be much shorter than food menus. For example, an appetizer menu or a dessert menu may be displayed on a folded paper table tent, a hard plastic table stand, a flipchart style wooden table stand, or even, in the case of a pizza restaurant with a limited wine selection, a wine list glued to an empty bottle.

Take-out restaurants often leave paper menus in the lobbies and doorsteps of nearby homes as advertisements. The first to do so may have been New York City's Empire Szechuan chain, founded in 1976.The chain and other restaurants' aggressive menu distribution in the Upper West Side of Manhattan caused the "Menu Wars" of the 1990s, including invasions of Empire Szechuan by the "Menu Vigilantes", the revoking of its cafe license, several lawsuits, and physical attacks on menu distributors.

6.3 Menu Board

Fig. 1: A menu board in a New Orleans diner

Some restaurants – typically fast-food restaurants and cafeteria-style establishments – provide their menu in a large poster or display board format up high on the wall or above the service counter. This way, all of the patrons can see all of the choices, and the restaurant does not have to provide printed menus. This large format menu may also be set up outside (see the next section). The simplest large format menu boards have the menu printed or painted on a large flat board. More expensive large format menu boards include boards that have a metal housing, a translucent surface, and a backlight (which facilitates the reading of the menu in low light) and boards that have removable numbers for the prices. This enables the restaurant to change prices without having to have the board reprinted or repainted.

Some restaurants such as cafes and small eateries use a large chalkboard to display the entire menu. The advantage of using a chalkboard is that the menu items and prices can be changed; the downside is that the chalk may be hard to read in lower light or glare, and the restaurant has to have a staff member who has attractive, clear handwriting.A high-tech successor to the chalkboard menu is the "write-on wipe-off" illuminated sign, using LED technology. The text appears in a vibrant color against a black background.

6.3.1 Outdoor

Some restaurants provide a copy of their menu outside the restaurant. Fast-food restaurants that have a drive-through or walk-up window will often put the entire menu on a board, lit-up sign, or poster outside so that patrons can select their meal choices. High-end restaurants may also provide a copy of their menu outside the restaurant, with the pages of the menu placed in a lit-up glass display case; this way, prospective patrons can see if the menu choices are to their liking. Also, some mid-level and

high-end restaurants may provide a partial indication of their menu listings–the specials–on a chalkboard displayed outside the restaurant. The chalkboard will typically provide a list of seasonal items or dishes that are the specialty of the chef which is only available for a few days.

6.3.2 Digital Displays

With the invention of LCD and Plasma displays, some menus have moved from a static printed model to one which can change dynamically. By using a flat LCD screen and a computer server, menus can be digitally displayed allowing moving images, animated effects and the ability to edit details and prices.

For fast food restaurants, a benefit is the ability to update prices and menu items as frequently as needed, across an entire chain. Digital menu boards also allow restaurant owners to control the day parting of their menus, converting from a breakfast menu in the late morning. Some platforms support the ability allow local operators to control their own pricing while the design aesthetic is controlled by the corporate entity. Various software tools and hardware developments have been created for the specific purpose of managing a digital menu board system. Digital menu screens can also alternate between displaying the full menu and showing video commercials to promote specific dishes or menu items.

6.3.3 Online Menu

Websites featuring online restaurant menus have been on the Internet for nearly a decade. In recent years, however, more and more restaurants outside of large metropolitan areas have been able to feature their menus online as a result of this trend.Several restaurant-owned and startup online food ordering websites already included menus on their websites, yet due to the limitations of which restaurants could handle online orders, many restaurants were left invisible to the Internet aside from an address listing. Multiple companies came up with the idea of posting menus online simultaneously, and it is difficult to ascertain who was first. Menus and online food ordering have been available online since at least 1997. Since 1997, hundreds of online restaurant menu web sites have appeared on the Internet. Some sites are city-specific, some list by region, state or province.

6.3.4 Digital Menu

The idea of the digital menu is very new and differs from an online menu. An online menu is a website presenting a food menu on an e-commerce platform but has no interface with meal production except sometimes receiving the order. A digital menu is a fully integrated food menu where the front-end is presented online as a web application, but as well as facilitating orders it is also linked to the kitchen or

other production facility. A digital menu can generate a variety of reports and is connected with the finance/point of sale system. It may also be integrated with inventory and accounting software.

6.3.5 Secret Menu

Another phenomenon is the so-called secret menu where some fast food restaurants are known for having unofficial and unadvertised selections that customers learn by word of mouth, or by looking them up online. Fast food restaurants will often prepare variations on items already available, but to have them all on the menu would create clutter. This can also occur in high-end restaurants, which may be willing to prepare certain items which are not listed on the menu (e.g., dishes that have long been favorites of regular clientele). Sometimes restaurants may name foods often ordered by regular clientele after them, for either convenience or prestige. At some fast food restaurants, secret menu items exist which were once part of the regular menu but are no longer advertised. These items may still be rung up as a regular menu item, and are assembled from ingredients that are still in use in other menu items.

6.3.6 The Importance of Menu Planning

1. Easy familiarity with dishes.

Menu planning will help you establish the types of cuisines your restaurant will offer. We're not just talking about planning your meals for the week, we're talking about the long term. The restaurant staff will master these cuisines since they are your restaurant's staple food and specials.If you offer items without following a set menu plan, it can be confusing to some staff — and we know that a knowledgeable staff is critical to the prosperity of any restaurant.

It would be costly and even embarrassing if a customer were to request a dish and an employee tells them it's unavailable when all the ingredients are sitting in the kitchen, ready for cooking and serving. These errors are more likely if you simply introduce and retire items on the menu without thorough planning. For example, what you cooked the past month is no longer among your dishes today.

2. Timely service delivery

- **Pre-process wait:** The time-lapse before it's a customer's turn to make an order.
- **In-process wait:** The time it takes to fulfil a customer's orders, such as preparing and serving dishes.
- **Post-process wait:** The delay in delivering the bill to the customer.

Your customers will likely dislike wait times, even if they last just a few minutes. However, customer opposition to these wait times varies in intensity depending on the dining stage.For example, a hungry customer would hate to wait two minutes before being attended to but could tolerate a five-minute delay in serving the bill (after the meal, of course). Similarly, an over-committed customer would

strongly dislike delays in delivering the bill.To reduce pre-process wait times, we suggest you transition to a digital menu, enabling customers to make their orders online (via your website) even before arriving at your restaurant.

3. Waste minimisation

Menu planning allows near-accurate prediction of the quantities of ingredients or food to stock up based on your dining capacity. Without adequate menu planning, you're prone to making mistakes while stocking up on supplies, which can lead to losses due to food waste.

For example, some restaurateurs, when they introduce a dish and begin to make early sales, would hurry to order more food supplies, spending money and hoping to sell as much as possible. They do this only to discover their kitchen and dining capacity isn't capable of storing and selling out the additional supplies early enough for some items not to start wasting away or expiring. This is one of the main reasons menu planning is essential.Menu planning will help shield you from food waste that results from low demand since you'd integrate some market data in the menu planning process. For emphasis, menu planning isn't complete if it doesn't account for market realities.

4. Ingredient variety minimisation

Menu planning helps you maximise the use of each ingredient.If you plan your menu carefully, you'll pinpoint every dish for which a particular ingredient works. Also, this will enable you to use the least variety of ingredients possible since some will likely cut across different cuisines.Not only does this help your budget, margins, and competitive advantage, but it also uses less storage space.Menu planning also helps you develop a list of core ingredients and identify their best suppliers. Your dishes are probably just a mix of ingredients, major and minor, and these ingredients have their periods of scarcity.Additionally, suppliers would have different prices, qualities, delivery times, etc. You should decide on the best suppliers to increase your competitive advantage and profit margin.By establishing reliable supply chains through menu planning, you won't be getting into the emergency trap (cited above) often. That said, establishing supply chains is a significant importance of menu planning.

5. Storage space optimisation

Storage space better serves its purpose when you plan menus in advance.Your restaurant most likely has limited space for stacking supplies. Planning your menu would ensure you order only what your stores can accommodate.This is because you've already designed the dishes and know their ingredients. With data on the estimated number of customers you expect to serve within a defined period, you'd know how many supplies to send to your store.If you add and remove items at will from your menu, the disadvantage will also manifest in storage. This is because the ingredients for those

other dishes are still in storage, and you're bringing in new ones before the previous ingredients are depleted.

6. Increased purchasing efficiency

Menu planning helps avoid any last-minute rush for ingredients and cooking resources. Its advantage in this sense parallels the benefit of menu planning for home cooking.If you don't take the time to account for all components of a dish, you'll be more likely to forget a crucial item without which the dish would be incomplete. This often happens among home cooks. Surprisingly, it also happens with restaurants, especially those who don't plan their menu well before approaching suppliers, the grocery store or local markets.

7. Restaurant branding

A staggering 89% of small business leaders in the hospitality industry say branding is a critical factor in their success, while 87% claim it helps bring in new clients.The first and most powerful avenue to establish your restaurant brand before customers is your menu. Your menu is part of what explains who you are and what to expect from you.Several other factors contribute to restaurant branding, but your menu is one of the top ones. For example, depending on your location and target customers, you can decide whether your restaurant would provide high-end dishes or cheaper options suited to students, construction site workers, etc. Ultimately, one should be able to understand from your menu, on their first visit, the type of restaurant you are.

8. Accurate prediction of staffing needs

Menu planning shows you the level of manpower needed to run your restaurant efficiently. Since menu planning clarifies everything about your staple dishes, specials, ingredients, quantities, and even the number of customers you'll serve a day, it's easy to reach a reasonable estimate of the required workforce.If you don't plan your menu, avoiding the mistake of over- or under-staffing would be difficult. This is because you can't foresee the amount of work your restaurant would do for customers.Suppose you did your market research well, especially on every dish you offer. In that case, you should have a realistic estimate of the number of customers likely to visit your restaurant and possibly the kind of food they'll order. This realistic estimate helps you plan the menu and determine the number of cooks and waiting staff you need.

6.4 Market data and staffing

Market research data won't necessarily guide your staffing decision directly. Even if you have a reasonably close estimate of how many customers your restaurant would garner, it's only when you decide to serve that full range of customers that market intel would play a direct role in determining manpower. Moreover, you need to figure out the type of recipe, prep time, equipment, etc., to decide

your staffing. Production in the generic sense is the process by which the products are created. In the context of food service, production is the managerial function of converting raw ingredients into menu items that are served to customers after going through various preparation techniques. To define food production it can be said that, it is the preparation of menu items in the needed quantity and in the desired quality at a cost appropriate to the particular operation.

The food production is not mere cooking and serving. It involves planning and controlling ingredients, production methods, food quality, labour and energy consumption. It is highly important that food production planning should be integrated with other managerial functions like organizing and controlling for a smooth flow of business.

6.5 Why Should Food Cooked

Food is cooked for the three primary reasons.

- Destruction of harmful microorganism, thus making food safer for human consumption.
- Increased digestibility.
- Change and enhancement of flavor, form, color, texture and aroma.

Cooking at proper temperatures can destroy pathogens. The amount of heat required tokill a particular microorganism depends on such factors as time, method, type of food and type and concentration of the organisms. Adequate cooking is a major factor in foodservice sanitation, but proper handling before and after cooking is critical. Many foods become digestible as a result of cooking. The aesthetic quality of food can be enhanced by cooking. The quality of any cooked food depends primarily on the following four variables.

- Type and quality of raw materials.
- Recipe and formulation for the product.
- Expertise of production employees and techniques used in preparation.
- Method and duration of holding food items in all stages from procurement through service.

Steps in Food Production

Production Decesions

The primary objective of production planning is transforming all the resources into outputs. The secondary objectives are deciding the product characteristics, service quality, cost control, labor control and the delivery process. Planning involves decision making. Decisions based on the necessary

quantities to be produced, the quality standards to be maintained and the cost of the food product are to be made every day in food service operations. The planning decisions must be made within the existing facilities and cannot be changed every now and then. For example in a hospital the number of patients may increase or decrease but the capacity of equipment in the dietary department does not change. So in order to meet the demands or surplus, the production manager should make necessary decisions to maintain a smooth flow of the production process.

The secondary objective of production is to decide the characteristics of the product or menu items for example whether limited menus in a coffee shop or a fixed menu in school food service.

6.6 Production Forcasting

The art and science of estimating the future events is forecasting and it is a function of food production. Forecasting should be directed towards achieving customer's satisfaction and also be concerned with preventing overproduction and underproduction. Needless to say, overproduction and underproduction creates extra costs. In case of over production managing leftover foods can be troublesome because they can lead to food safety issues and customers may be dissatisfied. On the other hand underproduction may involve labor costs because making the same product in small quantities a number of times is heavy on the labour side. Not only the labour cost is high but customers will be disappointed if the food quantity is less or is unavailable. Hence good forecast is essential to help in a smooth transition from the present to the future output.

For effective forecasting, good production records are important. Production record should include date and day of the week, hour of service, special events/ holidays, menu prepared, quantity of each item prepared and quantity of each item served. Many chefs and cooks can guess the production schedule accurately especially if the customers and the menu offered is static but when it is vice versa guessing does not always work. For this a scientific method of forecasting is needed and there are various methods of forecasting modules available.

6.7 Production Scheduling

Production Scheduling is defined as the sequencing of events based on time required by the food service operations to produce a meal. Production scheduling has two stages, one the planning stage and the second, the action stage. In the planning stage the production required is converted into the items to be prepared and distributed to supervisors of different sections. For example if for a dinner 200 servings of a main dish and a soup is ordered the main dish goes to the supervisor of the main

production and the soup goes to the soup kitchen. In the second stage that is the action stage supervisors assume responsibilities by preparing a production schedule.

The production schedule, also called as the production worksheet activates the menu and the production process. It is a form which may be used manually or in a computer. The basic information like unit, production date and meal should be included. Additional information like preparation, time schedule, menu items, over and under production, quantity to prepare, substitutions, actual yield, pre-preparation and special instruction are included. The production schedule is posted on a bulletin board and is available for the employee to understand what food items he should prepare. A variant of production scheduling is batch cooking. In this method the total quantity of menu items is divided into smaller quantities and then cooked.

6.8 Ingredients Control

Ingredient control is a major component of quality and quantity control in the production subsystem. The process of ingredient control begins with purchasing, receiving and storage of foods. There are two major aspects of ingredient control which is ingredient assembly and use of standardized recipes. The ingredient assembly can take place in an ingredient room . The concept of ingredient room dates back to 1950s when Flack in 1959 was the first to implement a central ingredient room and was successful in reducing labour costs.

The ingredient room is an ingredient assembly area designed to measure ingredients and be transmitted to various sections like main production, soup kitchen, salad kitchen, beverage area and so on. It is usually situated between the storage and the production area. It can be small limited to measuring dry ingredients or a room with facilities for preparation and store room. It can have a large refrigerator, a measuring scale and a work table for assembling and other necessary equipments. The ingredient assembly can be carried out in a centralized room. The primary function of the ingredient room is to coordinate pre-preparation measuring and weighing of the ingredients to meet daily production needs and advanced preparation needs for future meals. The ingredients for each recipe are weighed, measured, packed and labeled.

When computers are used a consolidated ingredient list based on individual ingredients or total ingredients needed for the production area can be obtained. If an operation does not have an ingredient room then the production employees are delegated work in obtaining supplies, weighing and

measuring ingredients every day which may be time consuming. so an ingredient room is advantageous.

Production of Recepies

A recipe is a formula by which the weighed and measured ingredients are combined in a specific procedure to meet predetermined standards. It is actually a written communication tool which is passed from the food service manager to the production employees. A recipe is and excellent quality and quantity control tool as it helps to set standards. Once a recipe is tried and tested many times it becomes a standardize recipe and always gives the same results. The detail of standardization is given in another module.

Quantity food production involves a complex set of variables which are important in controlling costs. The adoption of cooking methods is important which in turn depends on the menu a particular food service operation decides. Food is cooked for the reasons of destroying harmful microbes, to improve digestibility and enhance the palatable quality of the food. There are various methods of production and based on the menu, equipment and human resource available a food service operation can adopt either a single or combination methods.

Many different processes are involved in production of food service. Preparation can be simple like serving a simple fruit or could be complex like baking or combining many production methods. As we are aware basically heat is employed to cook food. Heat transfer can be in four ways – Conduction, convection, radiation and induction. Conduction – is by transferring of heat through direct contact. Heat is transferred from a heat source either gas or electricity through a cooking vessel to food. Grilling, boiling, frying are examples of conduction. Convection is the distribution of heat by the movement of liquid or vapour which can be either natural or forced. For example in deep frying, oil is the liquid in motion which transfers heat to the food product. The third type is radiation which pertains to the generation of heat energy within an object.

Infrared and microwaves are the two types of radiation followed in cooking. Broiling is the familiar example of infrared cooking. In a broiler an electric or ceramic equipment is heated by a gas flame and it becomes hot to emit infrared radiation which cooks the food. Microwaves have very short wavelength and are generated by an electromagnetic tube. Microwaves penetrate into the food and agitate the water or fat molecules resulting in a friction which creates heat which in turn cooks the product. The fourth type of heat transfer is Induction – Induction is the use of electrical magnetic fields

to excite the molecules on cooking surfaces. Induction heating is fast and the burner has no open flame. The heat used for production can be by moist heat or dry heat. If the heat is conducted by dry air, hot metal or hot fat the cooking is done by dry heat method.

6.9 Moist Heat Method

Most common moist heat methods are boiling, broiling, simmering, stewing, poaching, blanching, braising and steaming. To boil, simmer, stew or poach means to cook a food in water or a seasoned liquid. The high temperature toughens the proteins of meat, fish and eggs and the rapid movement breaks the delicate foods.

Boiling

Boiling is the cooking of foods by just immersing them in water at 1000 C and maintaining the water at that temperature till the food is tender. Boiling as a method of cooking is generally used in combination with simmering and other methods as in the preparation of curries, soups, stews and foods cooked in sauces.

Broiling

This is a dry heat method which uses direct or radiant heat from gas flames, charcoal or individual electric units. Meat is usually broiled and relatively tender and thicker cuts are the most suitable for broiling.

Simmering

When food is cooked at temperature just below boiling point of the liquid in which they are immersed, the process is known as simmering. When food has to be cooked for a long time like in stews or stock preparation.

Stewing

This is a gentle method of cooking in a pan with a tight fitting lid using small quantities of liquid to cover only half the food.. The food above the liquid is thus cooked by steam generated within the pan. The liquid is brought to boiling point and then the heat is reduced to maintain the cooking at simmering temperature. Stewing is therefore a slow cooking method taking from 2 to 4 hours depending on the nature and volume of foods being stewed.

Poaching

Poaching is cooking in small amount of liquid that is hot but not actually bubbling.

Blanching

Blanching of food is done by dipping the food in boiling water for varying periods of time (5 Seconds to 2 minutes) depending on the texture of the food to remove the skin or peel without softening the food. Blanching is also done by pouring enough boiling water on the food to immerse it for some time and immediately immersing it in cold water. This method helps to maintain good texture while improving the colour and flavor of the food. In addition the peels can be easily removed to improve digestibility, eliminate enzyme and microbial activity and make it safe for consumption in salads or pudding

Braising

Braising involves cooking food in a small amount of liquid usually after browning in it.

Steaming

This is the most common as well as the most desirable method of cooking fruits and vegetables. The texture, color flavor and nutrients of fruits and vegetables are better preserved when they steamed. Steam-jacketed kettles or steamers may be used for quick steaming. Perforated pans that allow the steam to circulate around the food product are desirable for use in steaming.

Dry Heat Method

Dry heat cooking methods include roasting, grilling and broiling, toasting, baking, sautéing frying

Roasting

This is a method in which the food is brought in contact with direct heat from a flame or any source of radiant heat. Roasting may be carried out using three types of equipment.

(i) Spit Roasting-

Spit roasting is done by using Spit or deep iron rectangular tub containing live coal on which meat pieces are skewed together and rotated at intervals using wooden handles on the skewers. Kebabs and barbequed foods are cooked using this method of roasting.

(ii) Oven Roasting

Electric or mud oven is used for these type of dry heat cooking mostly used for making tandoor and roasting of meat. It involves preheating of oven at 4250C placing the meat in it letting it brown for 5-10 minutes and cooking at moderate temperature 3500C – 3750C till tender. This method will help retain moisture and flavor due to even heat penetration and cooking.

Pan or Pot Roasting

In this method, roasting is done using heavy pan with enough fat coating the pan base where the food is roasted to brown the sides and then covered with a tight lid and food is cooked in slow fire till tender. The principle underlying this method of cooking is that sealing of food surfaces through coagulation of surface proteins helps retain moisture and flavor of the food.

To establish good production control Time and temperature elements are closely related in cooking and keeping accurate time and temperature control is critical to produce high quality products. Yield is the amount of products which results at the end of the production process. Yield is usually expressed as definite weight, volume of serving size. In addition to losses during preparation, cooking losses may occur and the yield may be decreased. Handling losses may occur not only during production but also during portioning before service.

6.10 Portion Control

Portion control is one of the essential controls in production of foods in quantity. Serving the same size to each customer is portion control. Portion control is one of the important controls in production of food.

To achieve good portion control the following steps could be practiced

1. Foods purchased should be according to specifications which will yield the expected number of servings.
2. Standardized recipes should be followed
3. Employees should know about the portion control utensils
4. A portion control guide can be used
5. Standard sized utensils can be used.

Nutrient Losses during Cooking

Moist heat lead to relatively greater loss of nutrients than dry methods of cooking but some of the nutrients are more stable than others as far as heat , temperature and time of cooking are concerned. Proteins, fats and carbohydrates are not lost in day to day cooking of foods but in vegetables which contain higher moisture, water soluble vitamins are lost due to destruction by heat or loss through leaching in the cooking water. Adding of salt in cooking water while soaking or leaching leads to loss of these vitamins. Losses due to oxidation and evaporation occur more often when vegetables are peeled and cut and kept for a long time before cooking. The size of the pieces determines the degree of losses. The cooking time and amount of liquid are important factors in nutrient retention. Repeated

washing of rice leads to loss of thiamine and nicotinic acid. Vitamin C is lost as it gets easily oxidized while Vitamin A is stable to heat and cooking by moist heat does not affect these nutrients

Dry heat methods are destructive especially shallow frying or roasting due to air exposure as compared to deep frying where oxidative losses are reduced. Nutrient can be retained using methods that can enhance the nutritive content of the food and prevent losses during preparation and cooking. Loss of nutrients during cooking can be prevented by using minimum amount of water. Cooking vegetables by sautéing in little fat or oil and allowing to steam in their own moisture on low heat till tender can help in retention of nutrients. Spices may be added before the steaming process. Increasing the acidity of foods by addition of tamarind or lemon juice helps to preserve vitamins. Cooking with lids closed for a short period of time can also prevent oxidative loss of nutrients. It is therefore important to ensure that food preparation methods make the nutrients easily available for absorption through improved digestibility of the food prepared for example sprouting or germination of legumes and pulses can enhance the nutritive content of the food and improve digestibility and absorption. Fermentation of foods enhances nutrient content of the food and combination recipes such as cereals and pulses cooked together increase the nutritive value of the meal.

Ensuring food safety and hygiene is important at individual, household and community level. It ensures that foods are safe for human consumption and that individuals do not develop any food-borne illnesses. This module equips participants with an understanding of key food safety and food hygiene issues and how these can be maintained within households and communities. The module explores different areas with regards to food safety including: food spoilage, food storage and food poisoning.

6.11 The concept of food safety and hygiene

Once food has been harvested, gathered or slaughtered, enzymes and bacteria become active in this food which cause it to deteriorate in texture and composition until it eventually becomes unfit for consumption. This deterioration is known as decay and leads to eventual food spoilage. Food safety and hygiene entail undertaking a series of measures to avoid spoilage and contamination of food. Food is considered safe for human consumption when it is free from substances like contaminants, toxins and micro-organisms that can cause undesirable reactions in the body when such foods are eaten. To ensure that food is safe for consumption, it should be:

- Protected from contamination by harmful bacteria, poison and other foreign bodies

- ❖ Prevented from having any bacteria present multiplying to an extent which would result in the illness of consumers or the early spoilage of the food.
- ❖ For some foods: thoroughly cooked to destroy any harmful bacteria present.
- ❖ Discarded when spoilt and/or contaminated

The benefits of proper food safety and hygiene are:

- ❖ More efficient utilization of food consumed by the body contributing to improved health and nutrition outcomes.
- ❖ Prevention of food-borne illnesses (and sometimes death)
- ❖ Less food wastage

6.12 Causes of food spoilage

Contamination of food stuffs can occur through different ways, including: inappropriate food handling at different stages throughout the food chain; poor hygienic conditions of the places where food is placed, prepared and/or stored; intentional or non-intentional mixing of food with other foods or non-food substances that are unhygienic (also known as food adulteration) and general poor environmental hygiene. Food can also be contaminated when put together with other foods that have already undergone spoilage. It is normal for food to spoil when no measures are undertaken to prevent its spoilage. Naturally, foods spoil over time due to the presence of either naturally occurring enzymes in particular foods or due to other external organisms or factors.

Fruits and vegetables spoil over time because of the presence of naturally occurring enzymes that cause ripening and eventually, decay. Food spoilage may also be caused by micro-organisms such as moulds (commonly seen on bread), or yeasts and bacteria. These cause the food to break down, rot or go sour. The food may then discolour, smell bad or become sticky and slimy. Chemical hazards like pesticides and toxic metals may also lead to food contamination and spoilage. Like other living things, micro-organisms such as bacteria, need food, warmth, moisture and time to grow and multiply. The ideal temperature for most bacteria is 30-45 °C. Bacteria thrive best in damp conditions and in moist foods. When the correct conditions for growth are present, bacteria can double in number every 10 to 20 minutes, so that in about six hours 1 million could be produced from just one bacterium! As they increase in number, micro-organisms feed on nutrients present in a food leading to chemical and physical changes in the natural composition of the food and eventually food spoilage. Boiling kills most bacteria and cold temperatures slow down their growth. Freezing does not kill bacteria, it only inactivates the enzymes (they stay dormant until they defrost).

Identifying spoilt food Food that is spoilt can be identified in different ways:

- Off odours: Foods tend to develop undesirable off-flavours and/or odours as they spoil
- Discolouration: Food undergoing spoilage normally changes in colour
- Slime / Stickiness: Gravy or soups sometimes become thick and slippery to touch.
- Unusual taste: Food that is undergoing spoilage often changes in taste.
- The production of gas: Some foods - especially when stored in sealed containers develop some gases which will be noticeable when opening the container.
- Mould growth: Other foods, e.g. bread develop fungi like growth which is easy to see with the naked eye

6.13 Foods at high risk of food spoilage

Some foods are prone to faster spoilage by micro-organisms than others. Foods that spoil fast are usually referred to as “high risk foods.” Most often these are ready to eat foods or rich protein foods and require refrigerated storage. Examples of these foods are:

- (Cooked) meat, including poultry
- (Cooked) meat products including gravy, stews
- Milk and milk products
- Eggs and products made from raw eggs
- (Cooked) Fish

6.14 Food cross-contamination

Previously safe food can spoil when it gets contaminated by bacteria from another food in a process known as cross- contamination. For example, it may occur when raw and cooked meat are cut on the same board or when fruits and vegetables are cut on a board previously used for cutting meat on but which was not cleaned. The main carriers of bacteria and causes of cross-contamination are:

- Humans
- Rubbish
- Pets and other animals
- Food, e.g. raw meat or poultry

In order to avoid cross-contamination:

- Do not let raw meat drip onto other food and keep raw meat separate from other food.
- Never use the same chopping board for raw meat and ready-to-eat food without washing the board (and knife) thoroughly in between.

- Maintain personal and environmental hygiene at all times. For example, always wash hands, chopping boards and utensils before starting food preparation All individuals carry bacteria in their intestines, nose, mouth and on their hands. These micro-organisms can easily be passed on to food when individuals do not maintain good hygienic practices, such as washing hands before cooking and after using the latrine.

6.15 Summary

Under this unit we have summarized the about menu board, its types & importance, food safety & hygiene, causes of food spoilage etc. In a restaurant, the menu is a list of food and beverages offered to the customer. A menu may be à la carte – which presents a list of options from which customers choose, often with prices shown, in which case a pre-established sequence of courses is offered. Menus may be printed on paper sheets provided to the diners, put on a large poster or display board inside the establishment, displayed outside the restaurant, or put on a digital screen. Since the late 1990s, some restaurants have put their menus online.

Food means any substance, whether processed, partially processed or unprocessed, which is intended for human consumption and includes primary food to the extent defined in clause, genetically modified or engineered food or food containing such ingredients, infant food, packaged drinking water, alcoholic drink, chewing gum, and any substance, including water used into the food during its manufacture, preparation or treatment but does not include any animal feed, live animals unless they are prepared or processed for placing on the market for human consumption, plants, prior to harvesting, drugs and medicinal products, cosmetics, narcotic or psychotropic substances.

Cross-contamination is the spread of bacteria, viruses, and other harmful components from one surface to another. Usually, this transfer happens due to not disinfecting and sterilizing surfaces and equipment. While any surface can be contaminated, the biggest worry comes from cross-contaminating foods. To understand cross-contamination, imagine cutting raw chicken. Raw meat contains several contaminants, most of which are killed when you cook the meat. Yet, these contaminants are also on the surface of the knife - where they can stay active for a long time. If you use the same knife to cut a vegetable that won’t then be cooked, you risk eating active contaminants.

6.16 Terminal questions

Q. 1 What do you mean by ingredients control? Explain it.

Answer:----------

Q. 2 Describe the importance of menu planning.

Answer:----------

Q. 3 Describe the concept of food safety and hygiene.

Answer:----------

Q.4 Write short notes on the following.

(a) Food cross-contamination

(b) Causes of food spoilage

Answer:----------

Q. 5 Write a short notes on history of human nutrition.

Answer:----------

Q. 6 Write a short notes onscope of health communication.

Answer:----------

Q. 7 Write short notes on the following.

(a) Online menu

(b) Digital menu

(c) Secret menu

Answer:----------

Further readings

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma