HOLY CROSS HOME SCIENCE COLLEGE, THOOTHUKUDI

Re-accredited with B Grade by NAAC

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

M.Sc (DIETETICS AND FOOD MANAGEMENT)

Semester III

Core Paper-16

ADVANCED BAKING

MSU/ 2017-18/ PG -Colleges / M.Sc. (Dietetics and Food Management) / Semester III / Ppr.no.16 / Core – 16

ADVANCED BAKING **L T P C**

4 1 0 4

Objectives:

This course will enable the students to-

1. Understand basic concepts of baking
2. Acquaint with the role of various major and minor ingredients in bakery products
3. Familiarize with baking process and operations.
4. Learn the quality parameters of bakery products.

Unit I

Bakery organization and Equipment

Bakery Organization- Structure, Duties and Responsibilities. Layout for Small Bakery and Bread Making Unit.

Equipment-Small Equipment and Large Equipment- Weighing machine, flour sifter, spiral dough mixer, vertical mixer, dough divider, bun divider and rounder, dough sheeter, deck oven, convection oven, rotary rack oven

Unit II

Bakery Ingredients and their role

Wheat: hard wheat and soft wheat, composition or constituents of flour, types of flour, characteristics of good quality flour, functions of flour.

Sugar: types and functions of sugar in bakery products.

Egg: Composition and functions of egg.

Emulsifier: Glycerol Monostearate and lecithin.

Unit III

Yeast, fats & oils, leavening agents & salt

Yeast: types and composition of yeast, characteristics of yeast, role of yeast during fermentation and function of yeast.

Fats and Oils: types of fats- milk and animal fats and vegetable fat and functions of fat in bakery products.

Leavening agents: methods and functions of leavening- mechanical, chemical, biological / natural and vapour pressure.

Salt: functions.

Unit IV

Bread and Cake Making Process

Yeast made products:

Bread: Ingredients and their function. Methods- straight dough method, salt delayed method, no dough time method, sponge and dough method and ferment and dough method. Processing, characteristics of bread- internal and external characteristics. Bread faults and their causes- external and internal bread faults.

Cake: Ingredients and their functions. Method- sugar batter method, flour batter method, blending method, boiled method, sugar water method, all in process method, foaming method. Characteristics of cake- internal and external characteristics. Cake faults and their causes- external and internal cake faults.

Unit V

Icings, Cookies and Pastries.

Icings: Butter cream, royal icings, almond paste, fondant icing, gum paste, American frosting, water icings/ glace icings.

Cookies: Difference between biscuits and cookies, method for mixing cookies, types of cookies, faults and their causes.

Pastries: types of pastry- short crust, puff, flaky, philoor filo, chox and Danish pastry

UNIT I (12L+3T)

INTRODUCTION TO BAKERY

History of Baking

The organized production of wheat by the Egyptians is considered by most historians tobethe beginning of the breads produced today. Many centuries after the Egyptians (about 40 0 B.C), the Greeks were preparing more than fifty kinds of bread, all baked in closed ovens. The Romans united the Greek and Egyptian developments in bread making with their own developments to start producing the bread in large scale. During the reigns of the emperors Augustus and Julius Caesar (100 to 44 B.C), public bakeshops were established in the cities of Roman Empire. Pastries of various kinds were traded to spectators during the games in the colosseum.

While Roman civilization spread throughout Europe, the Middle East, and the North Africa, the new profession of baking was born. Baking knowledge grew through experimentation and the influx of information from new conquered territories.

However, with the slow degeneration and collapse of the Roman Empire, the new baking industry also collapsed. Knowledge, the true legacy of Rome, was preserved in monasteries, and during the Dark Age mainly monks who kept their baking knowledge as well-guarded secret for many years practiced the temporarily lost art of baking. At the beginning of the thirteenth century, Philip II of France granted bakers the right to build their own ovens.

This movement by Philip against the power of the nobles and the church resulted in the incorporation of the Patissier Dublayers of Paris in 1270. Those were pastry and bread specialists, and, with an industry incorporating both prof essional baking was once more firmly deep-rooted.

The industry continued with only slight changes until the discovery of America and the influx of new ingredients, particularly sugar and cocoa. In 1675, the baking art was given another boost when a Sicilian pastry cook named Procopio went to Paris and opened the first ice cream parlor. This success gave rise to Dublayers who roamed the streets of Paris selling galattes and sweet breads. The distinction between pastry cook and baker became more clear in the early early eighteenth century. Bakers and pastry makers separated generally because of arguments about proper oven temperatures (bread requires a much stronger heat than delicate pastries). In 1790, the first school of baking opened its doors in Paris. The French Revolution unbound servant-chefs of French aristocrats. These culinary masters could now offer their knowledge and talents to the public.

Definitions

Bakery

- A Bakery is an establishment which produces or/and sells bread, pastries, cakes, biscuits, cookies etc.
- A bakery (or baker's shop) is an establishment which produces and sells flour-based food baked in an oven such as bread, cakes, pastries and pies.

Baking

- Baking is the cooking of food by dry heat in an oven in which the action of the dry convection heat is modified by steam. The dry heat of baking changes the form of starches in the food and causes its outer surfaces to brown, giving

it an attractive appearance and taste. The browning is produced by caramelization of sugars.

Principles of baking

- Preheat oven to the required temperature.
- Weigh ingredients accurately.
- Understand ingredient function.
- Distribute foods evenly on greased baking trays to assist even cooking.
- Foods need to be placed in the appropriate position in oven.
- Even sized items on the same tray, small items, bake faster than larger items.
- Do not mix different items on the same tray.

Different ingredients have different purposes

Flour – Provides protein and starch

This forms the structure of baked goods.

Liquids – Aid flour to form the structure of baked product. Also, aids other ingredients in chemical process that occur.

Water, milk, fruits or vegetable juice, yogurt, and sour cream.

Eggs – Eggs make baked products tender, add flavor and richness and can help to bind mixtures together.

Flavorings – Chocolates, spices, herbs and extracts such as vanilla and almonds.

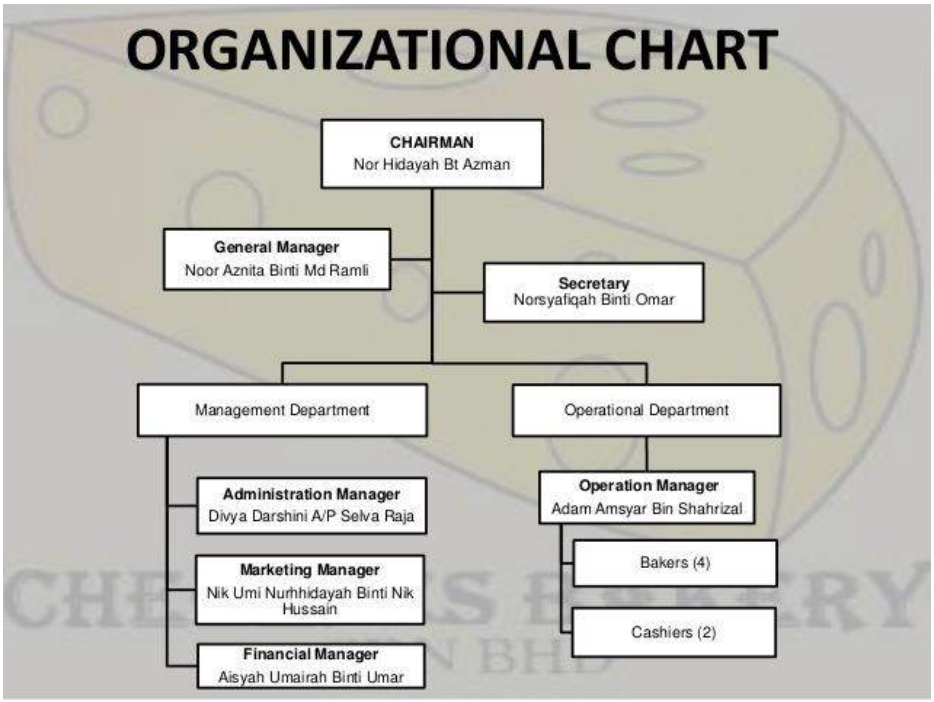
All types of food can be baked, but some require special care and protection from direct heat.

Events that occur during baking are:

- Fat melts
- Gases form and expand
- Microorganisms die

- Sugar dissolves
- Liquid evaporates
- Enzymes are inactivated
- Changes occur to nutrients
- Pectin breaks down
- Egg, milk and gluten proteins coagulate
- Starches gelatinized or solidify
- Caramelization occur

a. Bakery Organization- Structure, Duties and Responsibilities



DUTIES OF A BAKER

1. Establish and maintain high standards of sanitation.
2. Exhibit a strong foundation of baking methodology.

3. Exhibit nutritional awareness and implement food-for-life Principles.

4. Plan production of product and purchase, cost, and price product for profit.

5. Exhibit a solid foundation of techniques for food preparation, presentation and service, including competence in baking and pastry production, line work.

6. Use problem solving techniques in maintaining kitchen morale and building a team spirit.

7. Communicate clearly, both verbally and in writing.

8. Conform to professional standards in appearance, attitude, and performance.

9. Develop skills in problem solving, decision making, and critical thinking

10. Demonstrate display techniques as they apply to hot and cold dessert presentations.

11. Demonstrate basic knowledge and skills for display pieces, including chocolate, marzipan.

12. Plan and present a grand pastry buffet.

13. Demonstrate working knowledge of the factors involved in setting up and operating a baking and pastry facility.

14. Demonstrate the ability to keep accurate food business records and understand the relationship between financial profits and good business ethics.

15. Demonstrate creativity and sound thinking in solving management problems in merchandising techniques.

16. Demonstrate a commitment to the profession through activities such as attending meetings, seminars, continuing education programs, and professional association memberships.

b.EQUIPMENT NEEDED

OVENS

Baking ovens are major equipment for any bakery process. The major function of baking oven is to heat the wet dough, batter to a temperature where it becomes baked with desired texture and taste. Baking removes the moisture, which helps in improving the shelf life of the baked products plus it kills any microbes in the dough at a higher temperature. Accessories to baking oven are circulating fan, steam extraction, chimneys, safety explosion doors, fire tube, burners, drive, temperature controller and indicators, fuel system with baking molds and wire bands. Bakery ovens selection also takes dimensions into consideration such as height, width, weight, chimney dimensions, foundation method, electrical wiring and automation.

Fig. 1. Baking Oven

Types of oven used in bakeries

Baking Ovens are of various types used for baking breads, cookies, bakery products, cakes, pizza and cream rolls.

Different Types of Ovens

Ovens are a fundamental kitchen. It is a true investment, and it is important to know what baker's needs are and be able to articulate that into the type of oven, the baker is looking for. A baker need to know whether a baker want electric or gas, convection or conventional, and any add-ons a baker's desire.

Gas ovens

Similar to Cooktops, ovens fall under two main categories of energy sources – gas or electric. Gas ovens tend to be more expensive than electrical ovens of similar quality levels.

A common complaint about gas-powered ovens is that they tend to have hotspots and uneven heating throughout the oven. If a baker like baking, or have a problem with food browning, it is important to look into whether a baker would like a conventional or convection oven.

Electric ovens

Electric ovens work using heating elements placed on the inside walls of the oven. Electric ovens are also the easiest to use, easiest to clean and the easiest to achieve even cooking. They are also available in both convection and conventional varieties.

Conventional vs Convection ovens

Conventional ovens, also called traditional ovens, have no fans, and the air around the food is heated to cook it. Convectional ovens use fans to circulate that air, which usually cooks food faster and more evenly.

Steam ovens

Steam ovens are a less versatile, but more nutritious way to cook food. Using steam to cook food, means that less nutrients are lost and there is no need to use oil or butter. However, it is not great for getting any variation of color or texture.

Self-cleaning ovens

Self-cleaning ovens or Pyrolytic ovens are a luxurious way to cut down on a tedious maintenance job, but also provide comfort. Whilst cleaning, Pyrolytic ovens lock themselves until they reach a very hot 500°C, which turns any food remains of ash, which just sweep away when it is done. Cremating forgotten food remnants is possibly the most satisfying ways to clean an oven.

Principles of baking oven

Heat and temperature are not the same and should not be confused. It is relatively easy to measure temperatures in an oven, but much more difficult to measure heat, or heat flux, which is the rate at which heat is being transferred. Heat is transferred much more effective if the air is moving near the dough piece at a given temperature.

There are four major changes to the dough piece which can be seen as it is baked,

1. A large reduction in product density (the dough gets thicker) associated with the development of an open porous or flaky structure.

2. A change of shape associated with shrinkage or spread and increase of thickness

3. A reduction of moisture level, to between 1-4%.

4. A change in surface coloration (reflectance).

Although these changes are thought of as being distinct and sequential, broadly in the above order, as the product passes through the oven, it will be shown that there is considerable overlap and coincidence of these physico-chemical changes.

DOUGH MIXER

Working principle and method

* Put the dough smooth corners of workplace, plugged in, according to switch to start the motor, working free first, pay attention to the direction of rotation of the mixing with machine, gear same direction of the arrow on the cover, check whether the transmission system is normal and a reliable grounding machine shell.
* To the surface, stirring with besmear brushes a small amount of cooking oil, as to avoid the dough adhesive.
* First combine the flour, with the proportion of water 100:40-50, if the surface is relatively hard, midway can slowly add waste, if the dough with agitator rotational, along the surface of a pipe side scatter.
* Generally, with 3 to 8 minutes, the surface can be reconciled, turn the power off and pull out the dowel pin, will face dough, turn 90 degrees, with positioning pins, again started with the switch, turn back mixing with dough can be automatically removed. After the 5, and, in a timely manner to do a good job of cleaning maintenance.

  It is generally made to order, but available capacities vary from 25 kg to 35 kg. Most commercial modules are heavy and should be fitted with sturdy rollers for easy movement. The stainless steel bowl and beater should be washed and cleaned after every use and the machine should be serviced regularly.

EGG BEATER

* A hand tool that is used to manually mix and beat eggs or other similar ingredients, such as sauces, batter, egg whites and dressings.
* This kitchen stainless steel with stainless blades all of which can be easily cleaned.
* An egg beater is most often used for mixing and blending foods quickly, easily and without much preparation or cleanup.

UNIT II (10L+3T)

BAKERY INGREDIENTS AND THEIR ROLE

WHEAT

Flour obtained from wheat plays a vital in the manufacture of bakery products. Wheat is the most important cereal among all grains. The quality of wheat is determined by several factors depending upon the following conditions.

1. Soil 2. Quality of seeds 3. Climate

4. Manure 5. Farming techniques

The physical structure of wheat consists approximately of:

* Bran
* Outer skin or epidermis
* Second skin or epicarp
* Third skin or endocarp 15%
* Fourth skin or testa
* Fifth skin or Aleurone layer
* Germ 2.5%
* Endosperm 82.5%

In the production of flour for baking both bran and germ are removed during the milling process. Removal of bran is essential because the sharp edges of bran will tend to cut the cell structure of the loaf during proofing thereby affecting the volume of bread. Fermentation and proofing are the processes which take place after mixing when the dough is kept under controlled conditions. Bran is high in nutritive value, and is mostly used for animal feed. The

germ is removed from the wheat during milling. Because the germ is having high oil content which will affect the keeping quality of flour.

From 100 kg of wheat, 72% extraction is known as 100 percent straight flour comprising of all the streams. The word ‘stream’ is used in milling technology, which means flow of flour in a continuous succession of different stages in the flour milling process.

The remaining 28 percent consists of bran and shorts, which is akin to resultant Atta. This is mostly used for feed and industrial purposes.

During milling, the endosperm particles must themselves be categorized according to their size. The manner in which these particles are separated is called “separation”. Extraction refers to the percentage of flour which has been extracted from wheat kernel.

Therefore, an average flour, depending upon extraction and separation, will consist of the following:

Starch: 70%

Moisture: 14%

Protein: 11.5%

Mineral (ash): 0.4%

Sugar: 1%

Fat (liquid): 1%

Others: 2.1%

Wheat is classified in various methods such as

1. Type 2. Color 3. Hardness

Durum wheat is produced principally in two varieties, amber durum, which is used chiefly in making elementary pastes such as macaroni, spaghetti, noodles, etc., and red durum which has very little value for milling and is used principally as feed.

According to the type they are classified as

1. Triticum Aestivum (also called hard wheat)
2. Triticum Compectum (also called soft wheat)
3. Triticum Durum (also called durum wheat)

The Triticum Aestivum wheat flour contains more proteins. This flour is used for the production of bread.

The Triticum Compectum wheat flour contains low protein. So this flour is used for the production of biscuits, cakes and pastries:

The Triticum Durum wheat is mainly used to prepare and macaroni which is used chiefly in making elementary pastes such as semolina, macaroni, spaghetti, noodles, etc and red durum which has very little value for milling and is used principally as feed. All flours are not of the similar composition percentage-wise. Several factors such as the effects of climate, breed of seed, the type of seed, the type of wheat blended and proportions of the wheat used during blending and the storage period of wheat will also affect the quality of flour.

According to the Color they are

1. Red wheat 2. White wheat

This color variation is due to the environmental factors.

According to the Hardness it is classified into

1. Hard wheat 2. Soft wheat

Examples of Hard wheat are

1. Hard red winter 2. Hard red spring 3. Durum

Examples of soft wheat are

1. Soft red winter 2. Soft red spring.

Hard wheat

Bakery products are made from this type of wheat flour because hard wheat flour contains the following characteristics:

1. More protein.
2. More Water Absorption Power (WAP)
3. Good mixing capacity that is easy to mix
4. Good Fermentation tolerance
5. Good gas retention power

Hence it is mainly used for yeast products (Eg. Bread).

Soft wheat

Soft wheat flour contains the following characteristics

1. Low protein
2. Low Water Absorption Power (WAP)
3. Poor mixing capacity
4. Poor fermentation tolerance

Hence it is mainly used to make biscuits, cakes, and pastries.

Types of flour

Different types of flour are used for different types of end products. Flours are identified as First Patent, Short Patent, Medium Patent and Long Patent. Characteristics of these flours are determined by percentage of separation obtained from 72% extraction.

* First Patent constitutes 70% separation from 72% extraction. First Patent is used as cake flour and is obtained from soft wheat.
* Short Patent constitutes 80%. Short Patent is used for premium brands of breads
* Medium Patent 90% Medium Patent is used for featured brands of breads.
* Long Patent 95% separation from 72% extraction. Long Patent is used for competitive brands of breads.

Cake flours should contain less than 10% protein and 0.4% ash, and should have low absorption. Ash content of flour is considered as a measure of the amount of separation of the flour from a particular wheat blend, but is not a reliable index of baking industry.

Quality of proteins is a more important factor in determining baking properties of a flour than the protein quantity. Loaf potentialities are determined by the gluten quality and quantity.

Structure of wheat

The kernel of wheat is a storehouse of nutrients. The wheat is classified into 3 principle parts. They are :

1. Bran 2. Germ 3. Endosperm

Bran

Wheat contains 15% of the bran. It is the outer portion of the wheat. It has several layers. They are

1. Epidermis
2. Epicarp
3. Endocarp
4. Testa
5. Aleurone layers
6. Skin or Aleurone cells

The color of wheat is due to the testa. This layer protects the endosperm. The Aleurone layer has small cells. These cells have enzymes, which converts starch into sugar and it gives softness to the flour.

The bran contains more nutritional value, even though it is removed during the milling process, as the sharp edges may cut down the gluten. During milling, bran is removed and is used as animal feed.

Germ

Wheat contains 2.5% of germ. It is the sprouting section of the seed. During milling, the germ is removed because it has a fat a fat content that will spoil the flour quickly.

Endosperm

Wheat contains 82.5% of endosperm. Although primarily. Starch it contains the following nutrients.

1. Protein
2. Pantothenic acid
3. Riboflavin
4. Niacin
5. Thiamine

During milling, endosperm is separated from the bran and germ.

FLOUR

The English word "flour" is originally a variant of the word "flower" and both words derive from the Old French *fleur* or *flour*, which had the literal meaning "blossom", and a figurative meaning "the finest".

Flour is a substance, generally, a powder made by grinding raw grains or roots and used to prepare many different foods. Cereal flour is the main ingredient of bread, which is a staple food for many cultures. Wheat is the most common base for flour.

Cereal flour consists either of the endosperm, germ, and bran together (whole-grain flour) or of the endosperm alone (refined flour).

Types of flours

Flour provides the structure in baked goods. Flour contains a high proportion of starches, which are a subset of complex carbohydrates also known as Polysaccharides. "Bleached flour" is any refined flour with a whitening agent added. "Refined flour" has had the germ and bran removed and is typically referred to as "white flour".

Wheat flour

Wheat flour contains proteins that interact with each other when mixed with water, developing gluten. It is this elastic gluten framework which stretches to contain the expanding leavening gases during rising. The protein content of a flour affects the strength of a dough. The different wheat flour types contain varying amounts of the gluten forming proteins.

Bread flour

Bread flour is a hard wheat flour with about 12 percent protein. Bread flour is used for yeast raised bread because the dough yields more gluten than dough made with other flours.

Cake flour

Cake flour is a soft wheat flour that is 7.5 percent protein. The lower gluten content causes products to have a tender, crumblier texture that is desirable in cake.

Whole wheat flour

Whole wheat flour may be substituted for part of the white flour in yeast and quick bread recipes, but the volume of the finished product will be decreased. Whole wheat flour contains the nutritious germ and bran as well as the endosperm of the wheat kernel. Bran particles cut through the gluten during mixing and kneading of bread dough, resulting in a smaller, heavier loaf.

Wheat germ

Wheat germ, though not a flour, is often used in place of part of the flour in recipes for flavor and fiber. Protein, vitamins, minerals, and polyunsaturated fats are concentrated in the

germ of grain kernels. The following non-wheat grain products are often used in baked goods. They are rich in protein but most do not have the potential for developing gluten.

Constituents of flour:

1. Starch

2. Protein

3. Moisture

4. Ash

5. Sugar

6. Fat or Lipid

7. Others (Enzymes – Alpha and Beta amylase)

Starch

- Starch is not soluble in water until the starch is heated to about 140 F with 6 times of its weight of water.
- Water Absorption Power (WAP) of the flour mainly depends upon the damaged starch. Enzymes (alpha and beta amylase) act only on damaged starch to produce sugar for the yeast during fermentation. The damaged starch should not be more than 7 to 9% for bread making. Damaged starch is not essential for cake or biscuit making.
- Hot bread directly from the oven cannot be sliced immediately because the starch is not sufficiently stable and must be allowed to retrograde (slightly harder). When the bread cools down starch cells shrink and becomes rigid so that the bread can be sliced easily

Moisture

- An ideal moisture content of flour is 14 %. The source of moisture is from the tempering or from the package materials or from the humidity. If more moisture is in the flour it will reduce the storage life and will induce insect infestation and it may get fungus and bacteria and also it will reduce the WAP of the flour. This will result in less yield during production.

Protein

Flour contains soluble and insoluble proteins. Flour protein consists of

1. Albumin
2. Globulin
3. Gliadin
4. Glutenin

Soluble proteins are useful in providing nourishment to yeast during the fermentation process for its growth and reproduction. The insoluble protein and glutenin form a rubbery material when water is added to flour, so when it is mixed and kneaded well, a rubbery material is developed. This is called gluten. The quality of flour is determined by gluten content. If gluten content is more in flour, then it is suitable for high structured products like bread. This bread making flour should have gluten from 10-11.5 %.

Ash

The source of ash content in flour is from the bran. If the flour contains more ash, it means it has more bran. Too much ash gives a dark color to the flour and also cuts the gluten. Flour with higher ash content will not retain as much as a gas during different stages of processing and this affects the volume and gives poor texture to the product.

Sugar

Naturally flour contains a small quantity of sugar. That is sucrose and maltose. It is used as yeast food to produce CO2.

Fat or lipid

This should not be more than 1% in flour. It contains coloring pigment carotene, which gives color to the flour. There is a higher quantity of oil/ fat in the low grade flour than in high grades. The fat or oil when separated from the flour is a pale yellowish liquid without taste or smell.

Enzymes

Flour contains diastatic enzymes. They are alpha amylase and beta amylase. These enzymes hydrolyze starch and convert it into simple sugar. During fermentation the simple sugar is used by the yeast to produce alcohol and CO_2. The gas production depends upon the amount of enzymes found in the flour. Indian flours have less alpha amylase. These enzymes are necessary for producing good quality bread. In rain damaged wheat, the enzymes will be in excess. If the bread is made out of this flour the bread will have dark crust color and sticky crumbs. If these enzymes are less, the bread will have poor volume and dull crust color.

Classification of flour

Bakers use two types of flour. They are

1. Hard flour

2. Weak flour.

Hard flour contains 11.2-11.8% protein, 0.45-0.50% ash, 1.2% fat and 74-75% starch. Soft flour contains 8.4-8.8% protein, 0.44-0.48% ash, 1% fat, and 76-77 % starch.

Types of flour

1. High ratio flour
2. Whole wheat flour
3. Whole meal flour
4. Self-rising flour

High Ratio Flour

This flour is also known as special cake flour. This absorbs high liquids, fats and sugars than normal flours. It is normally manufactured for special order and it is used in special recipes. This flour is normally blanched with chlorine gas.

Whole Wheat Flour

It is milled for whole wheat grain and no bran or germ is removed during milling. When using this flour, it requires more liquid than mentioned in the recipes.

Self-Rising Flour

It contains a certain quantity of baking powder. If we use this flour, we should reduce the baking powder quantity from the given formula.

Characteristic of good quality flour

1. Color
2. Strength
3. Tolerance
4. High absorption
5. Uniformity.

Color

Flour should be creamish white in color. A good quality flour will reflect the tight when it is seen under the light. Bleaching the flour helps to get the color.

Strength

There are two types of flour.

1. Strong
2. Weak

It depends upon gluten quantity and quality present in the flour. For making bread, strong flour is preferred and weak flour is preferred for making cakes and confectionery products.

Tolerance

This is the ability of the flour to withstand the fermentation and/or mixing process in excess of what is normally required to mature its gluten properly.

High Absorption Power

This means the ability of the flour to hold the maximum amount of water. If the flour has less WAP the bread will not be of good quality and will have less yield.

Uniformity

If the flour used not uniform, then the quality of the product will differ. So constant monitoring and adjustments are required to get a satisfactory result.

Functions of flour in bakery products

* It acts as a binding agent and an absorbing agent.
* It is important for flavor
* It adds nutritional value

* It builds the structure
* It is the backbone of the baked products
* It affects the shelf quality of products.

SUGAR

Sugar is the generic name for sweet-tasting, soluble carbohydrates, many of which are used in food.

There are various types of sugar derived from different sources. Simple sugars are called monosaccharides and include glucose (also known as dextrose), fructose, and galactose. The "table sugar" or "granulated sugar" more customarily used as food is sucrose, a disaccharide of glucose and fructose.

Sugar is used in prepared foods (e.g., Cookies and cakes) and it is added to some foods and beverages (e.g., coffee and tea). In the body, sucrose is hydrolyzed into the simple sugars fructose and glucose. Other disaccharides include maltose from malted grain, and lactose from milk. Longer chains of sugars are called oligosaccharides or polysaccharides. Some other chemical substances, such as glycerol and sugar alcohols may also have a sweet taste, but are not classified as sugars. Diet food substitutes for sugar include aspartame and sucralose, a chlorinated derivative of sucrose.

Sugar is a staple of baked goods, used in varying quantities in almost every variety. Breads and pancakes use a small amount of sugar, with around a few tablespoons, while dessert breads, cakes, pies and other desserts use large quantities of sugar, usually with more than a cup. Sugar has many purposes in baking, although it is possible to substitute it with artificial sweeteners.

Types of sugar in baking

Granulated Sugar

What is granulated sugar? Granulated sugar is a refined sugar that is white in color and is the most common type of sugar used in baking. Granulated sugar has a slight coarseness to it but is still a very fine grain.

Brown Sugar (Light & Dark)

What is brown sugar?: Brown sugar is granulated sugar that has molasses added into it. Light brown sugar has a small amount of molasses added while dark brown sugar has a larger amount of molasses added into it. Molasses is even more hygroscopic in nature than plain granulated sugar so it keeps baked goods even more moist and adds chewiness.

Superfine Sugar (Castor or Caster Sugar)

What is superfine sugar? Superfine sugar, also known as castor or caster sugar, is a more finely ground granulated sugar, though not as finely ground as powdered sugar. This type of sugar is popular for professional baking, and is very commonly used in the UK, because it more readily dissolves into batters and doughs. However, it is difficult to find and is typically pricier than granulated sugar.

Turbinado Sugar (Raw sugar or sugar in the raw)

What is turbinado sugar?:

Turbinado sugar, also known as raw sugar or sugar in the raw, is a type of sugar that has been minimally processed. The texture of the sugar is very coarse, similar to the texture of sanding

sugar, and is light brown in color. Almost all of the molasses is removed from this type of sugar so it is dry in texture but does have a hint of molasses flavor lingering.

Pearl Sugar (Nib Sugar)

What is pearl sugar?: Pearl sugar, also called nib sugar, is a type of specialty sugar that is made by compressing granulated sugar into large hunks of sugar. This type of sugar is only used for very specific baking purposes as it does not dissolve into baked goods.

Properties of sugar in baking

Hydrolysis: Compound sugars like sucrose are split into their component sugars by specific enzymes or acids. Maltose and sucrose are hydrolyzed by the enzymes maltose and invertase, respectively.

Yeast Fermentation: Glucose, fructose, sucrose and maltose are readily fermented by bakers‘ yeast to produce carbon dioxide and alcohol as principal end products. Lactose is not fermentable because baker‘s yeast lacks the enzyme which could split this compound sugar.

Sweetness and flavor: since there is no physical or chemical test for sweetness it must, therefore, be related to taste.

Hygroscopicity and Hydration: Hygroscopicity is the ability of a substance to absorb moisture and retain it. Some sugars are more hygroscopic than others.

Solubility and Crystallization: The difference in solubility of sugars can be used to control crystallization in products that require higher amounts of sugar.

Softening: The tenderizing action of sugars in baked products with the resultant improvement in texture, volume and symmetry may indirectly be attributed to the ability of sugar to hold water.

Functions of sugar in baking

Sugar harvested from cane sugar is chemically identical to sugar harvested from sugar beets. The two are not easy to tell apart from each other and likely, have purchased both. Sugars perform several functions in bread and other bakery products. The functions of sugars in baking are listed below:

* Sugars are the source of energy for yeast activity.
* Sugar holds onto moisture, baked goods made with sugar do not stale as quickly as baked goods made without sugar.
* Sugar holds onto moisture; it keeps baked goods tender for a longer period of time.
* Sugar also serves to help reduce gluten development and tenderize baked goods.
* Sugar in baking is that it adds sweetness and flavor.
* Sugar serves to help leaven baked goods in a variety of ways.
* Sugar essentially serves as a cushion between the bubbles which stabilizes the egg foam.
* Sugar syrup or caramelized sugar is used to make intricate sugar decorations.

EGG

Egg is a most chief raw material used in bakery products. Besides the egg of ducks, geese and turkeys can be used for production. As this egg has different characteristics, bakers prefer hen eggs only.

Composition of Egg

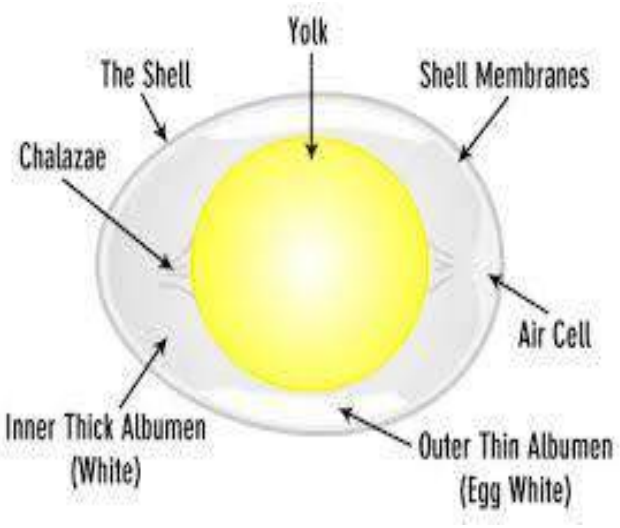
Egg is composed of the following three parts.

Shell 12%

White albumen 58 %

Yolk 30%

There are different grades and sizes of egg available in the market. The average egg white starts from 45 g to 70 g.



Structure of Egg

Types of Egg

There are two types of eggs used in bakeries.

* Shelled eggs
* Frozen eggs

Shell eggs, both fresh and cold storage, are sometimes used in bakery product. Dried eggs are also used and their usage is increasing. By far the largest amount is in the form of frozen eggs. Frozen eggs are sold as whole eggs, whites and yolks. In frozen whole eggs, the proportion of yolk and white may differ from the shell eggs - for often frozen whole egg is "fortified" by the addition of yolk. As far as shelled eggs are concerned quality eggs must be used to ensure quality of the finished products.

Quality Test

The egg quality can be judged by the methods.

Candling method

The quality of whole egg is generally evaluated by the candling method. Here, the egg is held before a bright light in a dark room and its contents observed through the

shell. If the center portion is dark and the rest is opaque, then it will be a good egg. If the rest of the egg parts are semitransparent, it indicates the beginning of deterioration and if it is formed nontransparent, the egg will be already spoilt.

Moreover, the egg is given a quick twirl and the extent of the resultant motion of the yolk is observed. If the movement of yolk is restricted, it will be a good egg because fresh egg contains thicker white compared to stale egg.

Salt Solution Test

Keep the egg in a vessel filled with 10% salt solution. If the egg sinks, its quality will be good. If it floats on top, it will be spoiled because the gas produced due to protein decomposition makes it lighter. However, on the basis of the experience, one can decide based on the speed of sinking.

Eggs may be further classified into:

Composition

1. Whole Eggs
2. Egg Yolks
3. Egg Whites

Whole Egg: In calculating the amount of eggs to be used in a recipe or formula, one can assume that the whole egg is approximately 75 percent moisture, the remainder being solids.

Yolk: The yolk of an egg contains most of the fatty material in a finely emulsified state. The approximate amount of lecithin fat in the yolk is 7 - 10% of total fat content. Yolks are used for improved creaming, greater volume etc. Although the yolk appears to be almost semi-solid, it contains almost 50% water.

Egg White: Egg white contains approximately 86% moisture. The whites are either firm or fluid in nature. The whites close to the yolk are generally firm, while the portion closer to the shell is fluid.

The composition of eggs is shown in the following:

Table 1. Composition of eggs

S.No.	Components	% Whole Egg	% Egg Yolk	% Egg White
1.	Moisture	73.0	50.0	86.0
2.	Protein	14.0	17.0	12.0
3.	Fat	12.0	31.0	0.2
4.	Sugar	0.0	0.2	0.4
5.	Ash	1.0	1.5	1.0

Functions of Eggs in Bakery Products:

1. Increase Nutritive Value:

Eggs are high in nutritional value and their use in baked goods improves the value of these products as food. Eggs are an important source of the necessary minerals iron, calcium and phosphorous. While milk is rich in calcium and phosphorous, it is low in iron. Iron exists in very small quantities in most foods, but egg yolk contains a relatively large amount in a form which the human body can assimilate readily. Egg protein is a complete protein, capable of supplying all of the essential amino acids required to maintain growth and good health. Both the protein and the fat, which is in the yolk, are of a nature to be readily assimilated by the body. In addition, eggs supply important amounts of vitamins A and D, thiamine and riboflavin.

2. Improve Flavor, Texture and Eating Quality:

Eggs have an odor which some people consider desirable in the baked products.

3. Aid in Producing an Appetizing Color in Both Crumb and Crust:

The yolk of the egg provides the desirable yellow color which gives the cake a rich appearance.

4. Acts as a Binding Agent to Hold the Various Ingredients Together:

Example - custards

5. Aids in Leavening, Especially in Products Such as Angel Food:

The foam from whipped or beaten eggs entraps air bubbles which expand when heat is applied. In the mix, they improve creaming, increase the number of air cells formed and coat these cells with a fat which permits further expansion of the air cells. In baking, the air cells expand further and the partial evaporation of moisture in the form of steam, increases leavening. When whipped, as for sponge cakes, the foam formed by the eggs affects the leavening.

6. Contributes Emulsifying Action:

Example - lecithin in yolk

7. Produces a Shorter Crumb:

Because of the fat and other solids of the eggs, the product had additional fat and tastes sweeter. Eggs also provide shortness in the mix, enabling the mix to be handled easily.

8. Improves Keeping Quality:

Because egg contains 75% moisture and natural ability to bind and retain moisture, they retard staling. This is especially true of products made with additional yolks.

EMULSIFIERS

Applications and Uses of Glycerol monostearate

Glycerol monostearate - glycerol ester of stearic acid widely used as thickening, emulsifying, anti-caking, and preservative agent in food and beverage industries. As a emulsifying agent, Glycerol monostearate can be used in a wide variety of industries including: food production, beverage, pharmaceutical, cosmetics, and various other industries. Glycerol monostearate is widely used as emulsifier, flavor enhancer in food production. As emusifying agent and texture stabilizer: in candy, chocolate and margarine to enhance flavor and prevent stratification. As thickening, emulsifying, anti-caking, and preservative agent: in biscuit, bread and pastry to improve the structure, prevent aging, promote fermentation and extend shelf life.

Applications and Uses of Lecithin

Lecithin -natural emulsifier and stabilizer in foods. It's widely used in cakes and yeast-leavened bakery products. This ingredient is found in raw materials such as eggs or soybeans, and can be used as a clean label ingredient. It is used as a: Wetting agent, Pan release agent, Cake batter stabilizer, Fat replacer

- **Origin**

Lecithin is a key component of cell membranes, and found frequently in nature. For example, it's in plant sources such as soybeans, corn and rapeseed. Also, it's found in animal products such as egg yolks. Egg yolk contains 10–20% lecithin, while most vegetable oils contain 0.1–3.0%.

UNIT III (10L+3T)

YEAST

Yeast is a living microscopic organism, which converts sugar or starch into alcohol and carbon dioxide, which is why beer brewers, wine makers and bread bakers like it. Baker's yeast is what we use most often for leavening when cooking. Baker's yeast is either active dry yeast (where the yeast is alive but inactive due to lack of moisture) or compressed fresh yeast (where the yeast is alive and extremely perishable as a result). Brewer's yeast is a non-leavening yeast used in brewing beer and can be eaten as a food supplement for its healthful properties (as you would wheat germ), unlike baker's yeast which is used for leavening. Brewer's years has a bitter hops flavor. Saccharomyces cerevisiae is known as top-fermenting yeast. It is one of the major types of yeast used in the brewing of beer so called because during the fermentation process it rises to top of the fermentation vessel. Beers that use top-fermenting yeast are called ales, and for that reason, these yeasts are sometimes called "ale yeasts".

Types of baker's yeast

- Cream yeast is the closest form to the yeast slurries of the 19th century, in essence being a suspension of yeast cells in liquid, siphoned off from the growth medium. Its primary use is in industrial bakeries with special high-volume dispensing and mixing equipment, and it is not readily available to small bakeries or home cooks.
- Compressed yeast is, in essence, cream yeast with most of the liquid removed. It is a soft solid, beige in color, and best known in the consumer form as small, foil-wrapped cubes of cake yeast. It is also available in a larger-block form for bulk usage. It is highly perishable; though formerly widely available for the consumer market, it has become less common in supermarkets in some countries due to its poor keeping properties,

having been superseded in some such markets by active dry and instant yeast. It is still widely available for commercial use, and is somewhat more tolerant of low temperatures than other forms of commercial yeast; however, even there, instant yeast has made significant market inroads.

- **Active dry yeast** is the form of yeast most commonly available to non-commercial bakers in the United States. It consists of coarse oblong granules of yeast, with live yeast cells encapsulated in a thick jacket of dry, dead cells with some growth medium. Under most conditions, active dry yeast must first be proofed or rehydrated. It can be stored at room temperature for a year, or frozen for more than a decade, which means that it has better keeping qualities than other forms, but it is generally considered more sensitive than other forms to thermal shock when actually used in recipes.
- **Instant yeast** appears similar to active dry yeast, but has smaller granules with substantially higher percentages of live cells per comparable unit volumes. It is more perishable than active dry yeast but also does not require rehydration, and can usually be added directly to all but the driest doughs. In general, instant yeast has a small amount of ascorbic acid added as a preservative. Some producers provide specific variants for doughs with high sugar contents, and such yeasts are more generally known as osmotolerant yeasts
- **Rapid-rise yeast** is a variety of dried yeast (usually a form of instant yeast) that is of a smaller granular size, thus it dissolves faster in dough, and it provides greater carbon dioxide output to allow faster rising. There is considerable debate as to the value of such a product; while most baking experts believe it reduces the flavor potential of the finished product, Cook's Illustrated magazine, among others, feels that, at least for direct-rise recipes, it makes little difference. Rapid-rise yeast is often marketed specifically for use in bread machines.

- **Deactivated yeast** is dead yeast, which has no leavening value and is not interchangeable with other yeast types. Typically used for pizza and pan bread doughs, it is used at a rate of 0.1% of the flour weight, though manufacturer specifications may vary. It is a powerful reducing agent used to increase the extensibility of a dough

FATS AND OILS

Introduction

A recent survey found 20 different varieties ranging from traditional butter with 81.5% fat to a low fat spread containing only 40% fat. If a fat is to be classed as a margarine under FSANZ (Food Standards for Australia and New Zealand) it must consist of at least 80% fat. If it has less than this amount it is classed as a spread. Most spreads are 70% or 75% fat. Table 1. shows typical fat contents of butter, margarine and spreads. It can be noted that the amount of salt varies considerably.

Table 2. Comparison between Butter, Margarine (Polyunsaturated), Spreads and "Light" Products

Types of Fat	% Fat	% Moisture	% Salt
Butter	81.5	16	2.4 – 2.6
Polyunsaturated Margarine	80	16	1.0 – 2.0
Typical Spread	70 – 75	20 – 25	1.0 – 1.8
Light Spread	60	35 –40	1.0
Low Fat Spread	40	60	1.0

All butter, margarine and spreads are water in oil emulsions. Margarine and spreads contain added emulsifiers such as lecithin and monoglycerides to aid in the emulsion preparation. Butter in contrast, contains milk fat lecithin, a natural emulsifier. Spreads are

originally designed for table use and not specifically for baking. Fat plays a different role in each baking application.

Types of fat used in baking

Shortening: Made from 100% vegetable fat, it is solid at room temperature. Acquired by the hydrogenation of vegetable oil, shortening provides pastries their flakiness, and gives cakes or cookies a lighter feel if creamed with sugar to trap air. Shortening affords breads with stability, preventing airflow within the loaf during baking, and gives a desirable smooth mouth feel and flavor.

Butter: Consists of 80% fat and is made from cream. The remaining 20% is water combined with milk solids. Butter imparts flavor and a greasy mouth feel to all baked goods due to solubility at body temperature.

Clarified Butter: Butter that has been heated to eliminate the sediment of milk solids therefore turning a clear color.

Margarine: Consists of 80% vegetable fat, can be used interchangeably with butter.

Oil: The original version of vegetable oil from soybean, canola or corn sources. It is used in some muffin, bread and cake recipes. Pastries are utilizing oil rather than the solid fat result in a mealy texture rather than flaky. In regard to cake recipes, interchanging oil for solid fat results in a heavier texture unless counteracted via increasing sugar or egg. To replace oil for butter or margarine, use 7/8-cup oil for one cup of butter or margarine.

Ghee: Class of clarified butter with a subtle yellow color and rich nutty flavor, used as a substitute for pure butter in many cultures. Vegetable ghee, made from various vegetable oils, is more commonly used than ghee made via butter.

Palm Oil: The main source of trans fat-free shortening; solid in nature at room temperature and made from palm oil.

Olive oil: Fat obtained from grinding whole olives and extracting the juice. Used in focaccia bread and also in any baked good recipe. Can be substituted for vegetable oil.

Lard: Pig fat has a very high smoke point, making lard ideal for culinary usage. In baking, lard is used in cookie production, pie crusts, and cakes.

Role of fat in baking applications

* Shortening reduces the toughness of dough.
* Fat provides nutrition. Fat is a good source of energy due to the high level of calories.
* Provides extensibility in bread dough.
* Improves texture and grain in bread.
* Helps to retain the gases released during baking thus ensuring a well risen loaf which will have a soft crumb and will stay fresh longer.
* Helps in aeration-The fat holds the air that is trapped in during the creaming stage and when egg is added they assist the fat in holding the air.
* Aids in laminating the product- Usually a "toughened" plastic type fat that can withstand the rolling and folding process of lamination. It allows the layers of fat and dough to be built up.

LEAVENING AGENTS

A leaven often called a leavening agent (and also known as a raising agent), is any one of a number of substances used in doughs and batters that produce a foaming action (gas bubbles) that lightens and softens the mixture. An alternative or supplement to leavening agents is mechanical action by which air is incorporated. Leavening agents can be biological or

synthetic chemical compounds. The gas produced is often carbon dioxide, or occasionally hydrogen.

When a dough or batter is mixed, the starch in the flour and the water in the dough form a matrix (often supported further by proteins like gluten or polysaccharides, such aspentosans or xanthan gum). Then the starch gelatinizes and sets, leaving gas bubbles that remain.

The leavening of bakery products could be brought about by the following four general ways:

1. Leavening by mechanical way (aeration)
2. Leavening by biological way
3. Leavening by water vapor
4. Leavening by chemical way

During mechanical aeration, there must be some ingredients in the mix that will hold the air bubbles and not allow them to escape. This is normally brought about by protein substances such as egg, egg white (albumen) or gelatin. Examples of products of this method are the production of marshmallow and icing (royal).

Another method of mechanical aeration is in the layers of dough with an insulating material in between. In such cases, a dough is used with well-developed gluten present. When the biscuit enters the oven the water in the dough layer is converted to steam and expands, lifting the layers. Examples of such leavened products are crackers and puff biscuits.

There are two commonly followed mechanical ways by which the air is incorporated into dough or batter, viz., (a) creaming, and (b) beating/whipping.

a) **Creaming:** During the creaming process the air is entrapped into the shortening, which expands when heated during the process. This gives volume to the bakery product. The pound cake is an example of this process, wherein none of the chemical leaveners are used.

b) **Beating/Whipping:** When egg whites are beaten or whipped they become fluffy and foamy because of the whipped-in air. This air incorporated during whipping of eggs, expands while the batter is being baked and causes the cake to rise. The sponge cake is example of cakes leavened by this manner.

Chemical method [by releasing of CO_2]

Some of the commonly used chemical leaveners are:

a) Baking soda

b) Ammonium bi-carbonate

c) Baking powder

a) **Baking Soda:** The chemical name of baking soda is sodium bicarbonate and has the chemical formula $NaHCO_3$. It is also known as 'bicarbonate of soda'. During the baking process, it liberates carbon-di-oxide, a leavening gas. The chemical reaction of gas formation is as follows:

$$2\ NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$$

b) **Ammonium Bicarbonate:** Ammonium bicarbonate is used rather extensively in cookies and in bakery products that are baked almost to dryness. During the baking process, it decomposes completely into gases like ammonia, carbon-di-oxide and water vapor.

The chemical leavening reaction of this salt could be written as under:

$$NH_4HCO_3 \longrightarrow NH_3 + CO_2 + H_2O$$

c) **Baking powder:** Baking powder is a chemical leavening agent produced by blending a water soluble sodium bicarbonate (baking soda). One or more acid reacting ingredients with or without any filler, such as starch, calcium carbonate or flour.

Baking Powder = Sodium Bicarbonate + One or more acid reacting material + Inert filler (starch, calcium carbonate or flour) (25-30% variable)

A chemical which is mixed with the recipes to increase the volume of products are called chemical agents.

Ammonium Bicarbonate or Bicarbonate

- When heated it release ammonium carbon dioxide and water
- Ammonium bicarbonate is used in cookies, crackers and similar products
- If the gas does not escape completely the taste and odor of ammonia remains in the bakery products.

The several acid ingredients used in the preparation of various types of baking powders are:

1. Tartaric acid
2. Citric acid
3. Cream of tartar
4. Acid calcium phosphate
5. Sodium acid pyrophosphate
6. Monosodium phosphate
7. Glucono-delta lactone

The chemical reaction between sodium bicarbonate and some of the selected acid ingredients is shown below:

1. Tartaric acid
2. Cream of tartar

Biological leavening agents

The yeast used in the preparation of the fermented bakery products (like bread, bread rolls, sweet doughs, crackers etc.) does the job of leavening by biological way. Here carbon dioxide gas is generated by fermentation. The one best adopted for the leavening of bakery dough is baker's yeast. Sugars such as glucose and fructose are substrates, which are

transformed into carbon-di-oxide and ethyl alcohol by fermentation. A simplified equation describing this fermentation reaction could be written as:

$$C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$$

Glucose/Fructose Ethyl alcohol Carbon-di-oxide

This carbon-di-oxide is responsible for the leavening of bakery products. The advantages of yeast leavening, as opposed to chemical leavening, are that it can contribute a characteristic taste and aroma and the evolution of gas can continue over a much longer period of time.

Yeast can also be used to make carbonated beverages like beer, which can then be used as leavening. Some typical biological leaveners are;

* Beer (unpasteurized—live yeast)
* Ginger beer
* Butter Milk
* Sour dough
* Yeast
* Yogurt

Some of the advantages of the leavening of bakery products are as under:

* It increases the volume of the bakery products.
* The leavened products being light and porous are easily chewed and digested
* Leavened bakery products are more palatable and appetizing than those made without leavening, which may be due to uniformity of cell structure, brightness of crumb color, softness of texture, etc.
* Baked products so made are light, and therefore easily chewed.

Yeast comes in two forms: (1) Fresh Yeast (also called Compressed Cakes) and (2) Dry Yeast (also called Dehydrated Granules).

Fresh yeast: Fresh yeast is soft and moist mixture of yeast plants and starch and is mainly used by professionals. The yeast remains active and will grow and multiply rapidly when added to dough. It has to be kept at refrigerated or frozen temperatures, as it is highly perishable. It keeps well only for a few days. Fresh yeast needs to be proofed before using.

Dry yeast: Dry yeast is a fresh yeast that has been pressed and dried until the moisture content makes the yeast in an inactive state (until mixed with warm water). Dry yeast has a much longer shelf life than fresh yeast and does not need to be refrigerated unless opened. Once opened, the dry yeast needs to be stored in the refrigerator away from moisture, heat, and light because it deteriorates rapidly when it is exposed to air.

There are two types of dry yeast: (Regular) Active Dry Yeast and Rapid-Rise Yeast. Though there are some slight variations in shape and nutrients, Rapid-Rise Yeast is the same as Instant Yeast and Bread Machine Yeast.

Functions of yeast

The primary function of yeast is to leaven the dough or to make it rise-and to produce a porous product.

Production of carbon dioxide: Carbon dioxide is produced by the yeast as a result of the breakdown of fermentable sugars in the dough. The development of carbon dioxide causes expansion of the dough as it is trapped within the protein matrix of the dough.

Development of fermentation flavor: Yeast imparts the characteristic flavor of bread and other yeast leavened products. During dough fermentation, yeast produce many secondary metabolites such as ketones, higher alcohols, organic acids, aldehydes and esters. Some of these, alcohols for example, escape during baking. Others react with each other and with other compounds found in the dough to form new and more complex flavor compounds. These

reactions occur primarily in the crust and the resultant flavor diffuses into the crumb of the baked bread.

SALT

Salt occupies a special position as an ingredient to enhance the taste palatability and flavor of foods. It is also a preservative of a variety of food products when used in large amounts. Cooking salt is almost entirely sodium chloride with other salts such as magnesium and calcium chlorides and magnesium, calcium and sodium sulphates constituting about 2-25% other trace elements are also found to be present in the cooking salt.

Functions of salt in baking

- Salt is an essential ingredient for most baked foods performs functions in baking that cannot be duplicated by any other ingredients.
- The ordinary granulated salt being relatively slow dissolving and contains higher levels of impurities (Copper, Iron & other metals), increases mixing time and accelerates gluten formation and hence toughen the dough through a direct action on the dough proteins or due to an inhibitory action of proteolytic enzymes and hence it is suitable for bread making.
- Helps to control the yeast activity in bakery products.
- Prevents the formation and growth of undesirable bacteria in bakery products.
- Improves the natural flavor of the products.
- Improves WAP.
- Improves the texture and grain of the products.
- The crust color of the product is enhanced by lowering the caramelization temperature of the sugar.

UNIT IV (15L+3T)

BAKING PROCESS

The knowledge of Bread making dates back to several thousands of years. Over the years, Bread making method has evolved, to meet the production and quality requirements from time to time. While the conventional methods of bread making are still popular, technological advancements during the last about fifty years have helped to develop new methods which are gaining wide acceptability in different parts of the world and also in our country.

Baking fermentation

- In the process of fermentation, yeast produces carbon dioxide, alcohol and other compounds which enable dough to rise and modify its physical properties. When the fermentation is correctly achieved, depending on the quality of flour among other things, the baker will obtain the proper external and internal characteristics (grain and texture) suitable for a determined finished product.
- Together with alcohol, a small amount of other volatile compounds are released. These are involved in the original taste and flavour of baked leavened products. Most of these compounds, and all of the alcohol, evaporate when baked.
- There are two stages during the fermentation of a dough made from flour, water, salt and yeast, and with no extra sugar added.
- First of all, yeast ferments sugars naturally present in flour, which can be directly and easily assimilated. These sugars represent about 1.5% of the flour weight. At the end of this first stage, gaseous releases more or less slow down.
- The second stage corresponds to the fermentation of a sugar contained in flour called maltose. Maltose comes from the action of some enzymes, the amylases, on the starch granules of the flour, damaged during the milling process. Amylases which are

naturally present in flour, split starch into small fractions of a much simpler sugar, the maltose. The action of amylases starts as soon as water is added to the flour and stops during baking.

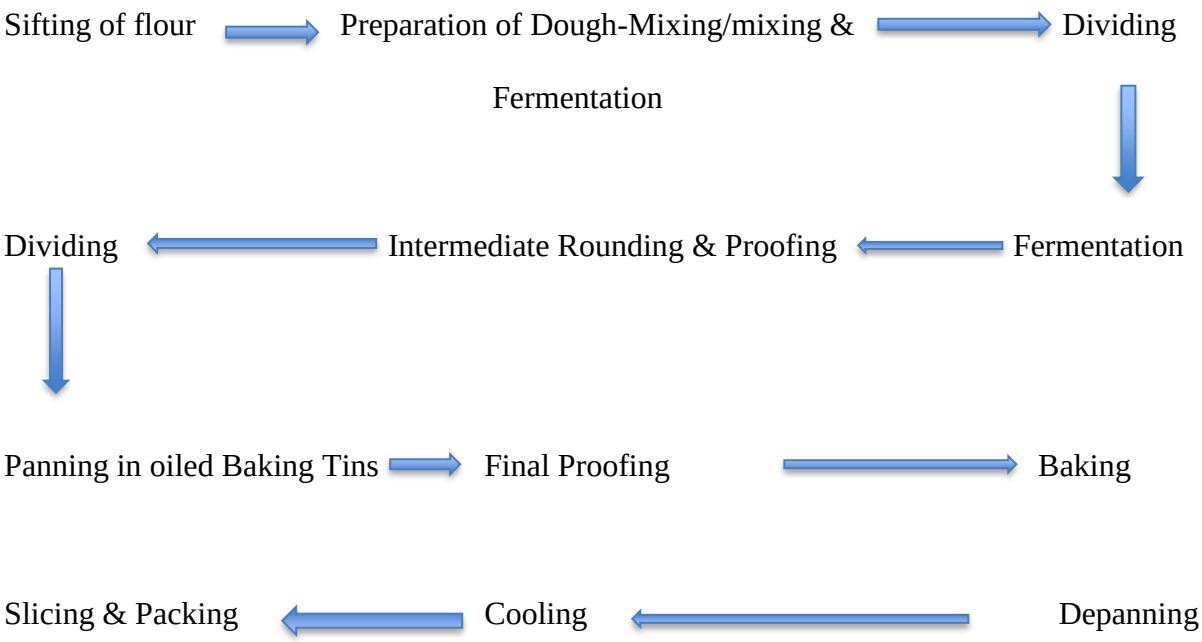
- The action of the flour amylases is completed by that of another enzyme of yeast, the maltase which, in its turn, splits maltose to give the most simple sugar, glucose. The glucose is transformed by the yeast into carbon dioxide and alcohol.
- Maltose formed from starch must be present in sufficient quantity so that the production of carbon dioxide makes dough rise correctly until it is put in the oven.
- Since 1960, the bakery industry has benefited from better adapted yeast strains, allowing a rapid process as they ferment the maltose sugar earlier. Effectively, the maltose is fermented only when there are no or little pre-existing sugars or added simple sugars left in the dough.
- The yeast industry has studied to a great extent baker's yeast strains, not only with a view to making them more rapid, but also to adapt them as much as possible to different types of baking processes.
- If sucrose has been incorporated into the dough, a yeast enzyme, the invertase, immediately transforms it, into glucose and fructose (the two basic links composing sucrose are thus separated).
- When sucrose or glucose are added to the dough, they are directly fermented before maltose. This means that in such a dough, mainly sucrose or glucose are consumed by the yeast. These sugars do not contribute to giving the bread a sweet taste since they are partly consumed.

COMMERCIAL BREAD MAKING PROCESS

The knowledge of Bread making dates back to several thousands of years. Over the years, Bread making method has evolved, to meet the production and quality requirements from time to time. While the conventional methods of bread making are still popular, technological advancements during the last about fifty years have helped to develop new methods which are gaining wide acceptability in different parts of the world and also in our country.

Process Steps

The production of bread consists of a number of different processing steps. These are as follows, in the sequence in which they are done.



. Bread Making Process

1. Sifting

This is the initial step where sifting of flour is done to remove any foreign materials that might be present in the flour. The sifting step also helps to aerate the flour.

2. Preparation of Dough

The next step is the preparation of the dough. There are different methods of preparation of dough, which involves either Mixing alone or Mixing and Fermentation. The dough preparation stage is a very important step in bread making and the different methods of dough preparation are generally referred to as different methods of Bread Making.

3. Dividing

The prepared dough is then taken for dividing into pieces of required size. Dividing is done either manually or using dividing machine.

4. Rounding and Intermediate Proof

After dividing, the dough pieces are rounded, to ball shape. The rounded dough pieces are passed in to the interproofer. Here the dough pieces get time to recover their extensibility so that they can be molded without breaking the surface skin to avoid stickiness and to get proper molding. These two stages are usually bypassed when dough is manually divided.

5. Molding

Here, first of all the dough is sheeted by passing through a set of pairs of rollers. Sheeting is done for expulsion of the trapped gases produced during the previous stages of processing The sheeted dough is then passed through a pressure board during which they get molded into a cylindrical shape.

6. Panning

At this stage, the molded dough pieces are placed into the bread baking tins, which are greased properly with refined oil or emulsion. Panning is done in such a way that the dough pieces are centrally placed in the tins with the seals facing the bottom. This will prevent subsequent opening of the sealed dough during final proofing.

7. Final Proofing

The panned dough pieces in baking tins are then transferred into Final Proofer. The Final Proofer is a closed chamber, where the required heat and humidity are provided for fast rising of the dough in the tins without surface drying. Final proofing takes normally about 50-60 mins. During the final proofing, the panned dough pieces gradually rises inside the baking tins due to a gas produced by yeast action and by the end of this stage, the dough pieces rises to the required level.

8. Baking

The fully proofed dough pieces, then transfer to baking oven. When the dough pieces enter the oven after final proofing, the activity of yeast still remain for a short period and at a faster rate due to increasing temperature, The dough pieces' increase in volume rapidly because of an increase in the rate of release of CO2 gas and gas expansion. This rapid increase in the volume is known as Oven spring. As baking proceeds yeast is deactivated, the proteins are coagulated, starch gelatinizes and set the structure of the product after which there will be no further increase in volume. Towards the end of baking golden brown color develop on the top and sides of the bread.

High temperature short time baking is considered ideal for getting soft bread. The normal baking temperature ranges from 220-260 degree Celsius, depending on the size and variety of bread

9. De-Panning and Bread Cooling

Once the breads come out of the oven, they are de-panned and are stacked on trolleys. For the purpose of slicing and wrapping, loaves must be cooled. Faster cooling can be achieved by forced circulation of air over the loaves. At the end of the cooling process, the temperature of the interior of the loaf shall be nearer to the room temperature. The humidity of the air in the cooling may be controlled to prevent excessive moisture loss from the surface.

10. Slicing and Packing

The sufficiently cooled breads are sliced and packed in polypropylene pouches.

Bread Making Methods

Conventional Methods

Chemical Dough Development (COD) Method

Mechanical Dough Development (MDD) Methods

Straight Dough method

Sponge & Dough method

Emergency Dough method

Delayed Salt method

Conventional Methods

The Conventional Methods are characterized by long fermentation periods. Depending upon the way the Mixing is done and the ingredients are added, these methods are further classified as discussed below:

Straight Dough Method

1. Mixing

This is the basic conventional method of bread making from which all the other methods are obtained. This method consists of a single Mixing process after adding to flour required quantity of water and all other ingredients such as yeast, salt, Vanaspati, preservatives, emulsifiers, improvers, etc. The mixing is continued till the dough is developed to a smooth consistency. The dough finish is kept somewhat firm to allow for softening of dough during the subsequent bulk fermentation period. Conventional slow speed double arm or single arm mixers or planetary mixers are generally used. The Mixing time ranges from 15 - 30 minutes, depending upon the type and speed of mixer and batch size. Mixing is to be continued till elastic dough with a smooth, silky and non-sticky finish is obtained. Spiral mixers or Horizontal

mixers can also be used for faster dough development. The desired dough temperature at the end of mixing is about 80^{o} F. The temperature of water needs to be adjusted to get the desired dough temperature. During mixing the flour, proteins are hydrated and form a combined elastic protein called gluten.

2. Bulk Fermentation

The mixed dough is then kept for Bulk Fermentation, generally for about $1^{1/2}$ to $2^{1/2}$ hours. The duration of bulk fermentation depends upon the quality of flour used, with stronger flour requiring longer fermentation. Other major factors determining the time of bulk fermentation are the quantity of yeast used and dough temperature. The mold and rope inhibitors added to the dough as well as added sugar and salt depresses the fermentation rate. During fermentation the pH drops from 5.3 to as low as 4.5 due to the formation of organic acids. The lowering of pH has a marked effect upon the hydration and swelling of the gluten, rate of enzyme action and other chemical reactions involving organic compounds.

The lowering of pH and action of proteolytic enzymes on protein, production of organic alcohols etc., alters the colloidal structure of proteins in dough. This helps to increase the extensibility and elasticity of the gluten, thereby enabling it to form thin gas retaining cells which can expand without rupturing. A dough with maximum gas retaining capacity and has developed maximum elasticity and springiness is said to be mature. Lower temperature prolongs the fermentation time and higher temperature may lead to wild fermentation. The temperature of 80 – 85^{o} F and RH of 75% is optimum.

It is a normal good practice to activate yeast before adding to the flour. Activation of yeast is done by dispersing yeast required to be added in each batch, in a bucket or suitable vessel, with enough water (about 1 lit water per kg yeast). Some quantity of sugar and flour are also added. The dispersed yeast is kept for about 20 minutes to activate. This helps to reduce the quantity of yeast and also to get faster fermentation. The fermenting dough is generally

given one or two knock backs 'which improve the gas retaining property as well as the rate of gas production. Knockback refers to punching of the gas built up during the fermentation period. It is generally given after the lapse of about 60 to 65% of the fermentation period.

Advantages of Straight Dough Method

It is a simple process. It requires lesser processing time than sponge dough method. The power and equipment requirements are larger from investment point of view. This method gives characteristic bread flavor to the product.

Sponge and Dough Method

Another conventional method, the popular method is the Sponge and Dough Method. This method consists of two steps mixing. At the first mixing 'stage some portion of the flour (about 65 - 70% of total), yeast (full or part), small quantity of sugar (about 1., 2%) and required quantity of water are mixed together. The mixed mass is called' Sponge'. The consistency of sponge can vary from soft to stiff depending upon the baker's preference. Mixing is done just to blend all the ingredients to a smooth homogeneous mass. As mixing is not done to full extent of smooth finish, at this stage, only part development of gluten is achieved. This will enable the Sponge to retain some gas, and rise in volume during fermentation. The temperature of sponge is desired to be at about 80^{o} F for optimum results.

The Sponge is allowed to ferment for 12 to 212 hours depending on the flour quality and quantity of yeast. The fermentation takes place faster than that in straight dough method as yeast inhibiting agents such as salt are absent.

At the end of the fermentation, the sponge is again mixed with the remaining ingredients, namely balance quantity of flour, sugar, vanaspati, emulsifiers, water, etc. This second mixing is done until the dough is fully developed to a uniform, smooth, shiny and non-sticky finish. The developed dough is then kept for a short second fermentation called "Floor

Time". Floor time ranges from 15-20 minutes and this improves the machinability of the dough. Thereafter the dough is taken for further processing.

Advantages and Disadvantages

Sponge and Dough method helps to get bread with better Volume and internal (crumb) characteristics. It is more flexible with respect to mixing and fermentation and also helps to save on yeast. Can handle weaker flour for bread production. But the process requires more plant space. Also power consumption and machinery requirements are more. The fermentation losses are relatively more.

Delayed Salt Method

This method is a modification of Sponge and Dough method. Here the entire quantity of flour for a batch is taken at the first mixing stage itself, thus it is a 100% Sponge method. After first mixing bulk fermentation is given for 2 - 3 hours depending upon flour quality. After fermentation the dough gives a second mixing during which all the salt is added towards the end of the mixing period. No flour is added in the second mixing. The mixed dough gives time and processed further. This method can be used for processing strong flour, which otherwise would require much longer mixing and fermentation time.

No Time Dough Emergency Dough

This method is used only in the case of an emergency situation when dough has to be made ready for processing in a very short period of time. Thus, it is used typically in situations such as machine breakdown or last minute urgent orders. The method typically involves straight dough mixing. The dough is made using a much higher quantity of yeast - almost double the quantity. The dough temperature is also kept relatively higher at about 28 - 30 Deg C. After mixing, the dough is taken immediately for further processing.

Advantages and Disadvantages of Emergency Dough

The advantage of this process is that bread can be made in a relatively short period of time. However, the quality of bread is usually inferior to that produced from the normal conventional process with respect to internal characteristics. It has higher ingredients, cost and does not have a good Bread aroma.

Chemical Dough Development (CDD) Method

In this method, the required development of dough is achieved by use of certain chemicals, typically reducing agents: The dough is mixed in normal mixer and all the ingredients are added together. After mixing the dough is taken for subsequent processing without any fermentation. The development of dough is achieved by addition of reducing agents such as L-cysteine hydrochloride and sodium metabisulphite which assist in softening of gluten. These chemicals also reduce the time required for mixing of the dough. These reducing agents are used in low level and are often used in conjunction with usual bread improvers having components like Ascorbic Acid and Potassium Bromate. The advantage of the Chemical Dough Development method is that it does not require special-costly machines for fast mixing. It also does not require high energy consumption. The process is faster than conventional method 'and produces reasonably good quality bread. However, the bread lacks in flavor and aroma as compared to conventionally processed bread.

Mechanical Dough Development (MDD) Method

According to this method, the normal development of dough, achieved during long mixing and the bulk fermentation period in the conventional methods, is achieved by intense mixing and high energy input. The most common one is the Chorleywood Bread Process (CBP) originated in the UK. This method uses specially designed high speed mixers, which are capable of completing the dough development in a much shorter mixing time of 3 to 5 minutes. The mixing intensity is such as to impart an energy input of about 11 kWh kg of dough in less

than 5 minutes. The method involves adding all the flour, water and other ingredients into the mixer bowls and straight mixing for about 3 minutes. The mixed dough is well developed and is immediately taken for further processing of dividing and baking. This process has become popular in our country also and most of the bakeries in the northern part of the country follow this method.

Advantages and Disadvantages

This method enables reduction in the total production time. Generally, the internal characteristics of bread produced are much finer. Because of more addition of water, higher yield of bread is achievable. As the mixing time is within a short range the dependence of bread quality on the skill of mixing operator is less. The requirement of space is much less compared to conventional method. The process requires special mixer with High energy input and power consumption. Yeast consumption is higher. The requirement of chilled water, with low water temperature is essential. The bread produced does not have characteristics, bread aroma as compared to conventional method.

EVALUATION OF BREAD

Bread Faults

Bread faults, which can be many in number, may be broadly divided into two main groups, namely External Faults and Internal Faults. These faults may originate from poor quality of ingredients or from a faulty production process, or a combination of both. The occurrence of bread faults will not be frequent and their effects not severe if proper precautions are taken to ensure, use of proper quality ingredients, use of right formulations, adherence to proper process conditions at different stages of production and that equipment are kept at optimum operating efficiency. It is convenient to list them according to bread quality characteristics and indicate various possible causes and remedial actions for the benefit of bakers.

External Faults

Nature of Fault Some probable causes to be corrected

Lack of Volume

a) Insufficient Yeast

b) Insufficient water absorption

c) Too much salt

d) Excess of diastatic activity in flour

e) Over-mixing or under-mixing of dough

f) Over- fermented for under- fermented doughs

g) Too Iowa dough temperature

h) Insufficient final proof

i) Improper humidity conditions during proofing

j) Insufficient dough weight for baking tin size

k) Excessive oven temperature

l) Weak flour

Excessive Loaf Volume

a) Insufficient salt

b) Over-aging of dough

c) Over proofing

d) Too much dough for pan size

e) Low oven temperature

Pale Crust Color

a) Insufficient sugar

b) Deficiency of diastatic activity

c) Too high a fermentation temperature

d) Skinning of dough during proofing

e) Dry proof box

f) Over- fermentation of dough

g) Low oven temperature

h) Low top heat in oven

i) Too short a baking period.

Crust Color Too Dark

a) Excessive sugar in formula

b) Immature dough

c) Too high an oven temperature

d) Excessive top heat in oven

e) Over-baking

f) Oven atmosphere too dry

Crust Blisters

a) Improper mixing

b) Immature dough

c) Incorrect moulding

d) Excessive steam in proof box

e) Excessive oven steam leading to condensation

Excessive Crust Thickness

a) Insufficient sugar

b) Deficient diastatic action

c) Skinning of dough during proofing

d) Over-aged dough

e) Low oven temperature

f) Too long a baking period

Shell Tops

a) Immature flour freshly milled

b) Deficiency in diastatic action

c) Excessively stiff dough

d) Immature dough

e) Insufficient Final proofing

f) Dry oven steam

g) Skinning of dough during proofing

Uneven Shape

a) Flour with high maltose figure

b) Excessive amylase addition

c) Improper moulding

d) Improper panning placement in baking tin

e) Improper final proofing

f) Improper depanning and handling of hot bread

g) Use of blunt slicing blades

h) Damages during slicing and packing

Internal Faults

Nature of Fault Some probable causes to be corrected

Dull Crumb Color, lacking brightness

a) Improper dough mixing

b) Too long final proof

c) Over fermentation of doughs

d) Improper dough development

e) High fermentation temperatures

f) Excessive use of dusting flour

g) Excessive use of oil at divider

h) Improper moulder setting

Coarse Grain (Non uniform cellular structure)

a) Weak Flour

b) Very stiff doughs

c) Too high water absorption (slack doughs)

d) Over - mixing

e) Under fermentation

f) Improper moulding

g) Insufficient dough weight for pan size

Poor Texture (Thick cell walls)

a) Very stiff doughs

b) Improper mixing

c) Excessive amylase action

d) Over fermented doughs

e) Skinning of sponge or dough during

fermentation

f) Excessively high proof box temperature

g) Over-proofing

h) Insufficient dough weight for pan size

i) Incorrect use of bread improver.

Poor Flavor

a) Low quality ingredients (flour, yeast, etc)

b) Insufficient salt

c) Unbalanced formula

d) Over fermentation / Under fermentation

e) Excessive use of yeast

f) Over proofing

g) Under baking

h) Poor bakery hygiene

i) Use of old trough and pan greasing material

j) Presence of external odors

Poor Keeping Qualities

a) Unbalanced formula

b) Poor quality ingredients

c) Improper mixing

d) Over fermentation / Under fermentation

e) High dough temperature

f) Oven final proofing

g) Low oven temperature

h) Improper bread cooling conditions

Holes in Bread

a) Use of freshly milled flour

b) Weak flour

c) Insufficient salt

d) Improper mixing

e) Excessively stiff doughs

f) Over fermented doughs

g) Skinning of sponge or dough

h) Improper molding

i) Excess divider oil

j) Too high a proofing temperature

Bread Staling

Bread, which has a moist and spongy crumb, is subject to a continuing deterioration in quality, particularly with respect to the firmness and eating quality, and this change is commonly called as 'Staling'. The staling occurs to both the crust and crumb portions of bread during storage. Actually, the staling process begins from the time the. Bread is cooled and continues progressively thereafter.

The crust, which is dry and crisp when fresh becomes softer and leathery upon staling. It also loses its appealing aroma. 'Whereas in the case of crumb staling, the texture becomes a film. The crumb also becomes harsher and crumbly as bread stales. The aroma and eating quality deteriorate on staling. As the staling progresses, the crumb also loses moisture. However, the qualities lost because of staling can be regained to a great extent by heating to a temperature above 60 ^{o} C.

Retarding of Staling

Though there is no practical way for entirely stopping staling of bread, various methods have been developed for retarding its rate. This is achieved by use of proper ingredients and use of various special additives. Bread made from weak flour, which have lower gluten content stale much faster than that from stronger flour. Addition of vital wheat gluten markedly reduces the rate of staling. The addition of other ingredients such as milk solids, sugar, vanaspati and soya flour has also beneficial effect on staling rate. Flour with low amylase activity, gives bread that stales faster. Addition of fungal or bacterial alpha-amylase help to reduce the rate of staling on storage. Use of dough conditioners such as Glycerol Mono Stearate (GMS), Sodium

Stearoyl Lactylate (SSL) and Datem Esters is known to bring about remarkable improvement in the retardation of bread staling and hence are widely being used in Bread industry,

Extrusion Dough Sheeting

A dough sheeter is a kitchen machine that rolls out pieces of dough to a desired thickness. The resulting sheets are smooth, uniform and completed in a few minutes, a much shorter turnaround than rolling by hand.

A countertop or a table top dough sheeter is a piece of industrial equipment that bakers can use to make the dough in large quantities without taking a lot of time. It is perfect for restaurants and bakeries with tons of orders on favorite foods, including pastries, pasta, and pizza.

A dough sheeter is an appliance used in food preparation, which flattens the dough into sheets. The general principle is that baker puts an oval sized ball into the top of the machine and a very uniformly rolled sheet will come out at the bottom. Dough Sheeters have used in a number of restaurants.

The dough is compressed between two or more rotating rollers. When done the right way, a smooth and consistent dough sheet is produced. The dough then passes one or several gauging rollers (mostly on conveyors) that reduce the dough to the required thickness. After this the dough sheet is shaped into a desired dough product. This technology is mainly used in industrial production machines for (semi) industrial bakeries and the food industry. Most dough sheeters can handle a wide variety of dough, depending on the machine manufacturer. Most commonly dough sheeting technology is used for the production of laminated dough products like croissants and pastries, but it is also suitable for the production of bread, flatbread and pizza.

Function

Shape the dough from individual dough batch to continuous dough sheet

Less damaging of the gluten network

Laminate layers of dough together (no pocket proofers and dividers are necessary as the dough sheet is the base of every product).

Benefits

A big benefit for using sheeting technology is the large dough capacity that can be handled. Dough sheeting manufactures are able to process high quality dough sheets at high capacities. Another benefit is that sheeting makes it possible to handle a great variety of dough types which traditional dough production systems can't handle, for example strongly hydrated wet and sticky ciabatta dough.

Most dough sheeters can handle a wide variety of dough, depending on the machine manufacturer. Most commonly dough sheeting technology is used for the production of laminated dough products like croissants and pastries, but it is also suitable for the production of bread, flatbread and pizza.

High Quality Dough Sheets

Extrusion sheeting uses a twin-screw extruder with an innovative wide-slot die to produce a thin sheet of dough directly feeding a rotary cutter. The products are the same as those produced

on a conventional dough sheeting line, but the equipment is considerably simpler and more flexible. Extrusion sheeting instead of conventional mixing, sheeting and gauging reduces both the capital investment needed for a snack cracker line and the floor space required.

Dough Extrusion Sheeter

The lines are simple to operate and, having fewer units, give significant reductions in cleaning time and maintenance costs. The system is suitable for any type of baked or fried snack that is cut from a sheet of dough. Wheat and maize are the most common ingredients, but many types of flour can be processed, either on their own or as part of a blend.

The process supports dedicated lines running at high output, and the low cost and flexibility of the line also makes the production of small batches of snack crackers economically viable. The extruder can be quickly and easily switched to make other snacks such as direct expanded curls and balls, or co-extruded filled pillows, bars and wafers.

Continuous bread making methods

This method comes under the broad category of MDD. The process involves continuous dough preparation of MDD under pressure with a continuous flow of ingredients. The developed dough is extruded into baking tin directly instead of moulding. Normally, a preferment brew is used in these processes to get the desired flavor. There are two common methods of producing bread continuously.

Do-Maker Process

In this process, a brew is made by stirring a mixture of water (60%), sugar (8.0), yeast (3.0), yeast food (0.50), salt (2.0), and mold inhibitor. The brew is fermented for 3 to 4 hours during which temperature rises by 10 - 15 o F and pH drops from 6.5 to 4.7. The fermented brew, other ingredients, flour and remaining water are metered into a mixer. The dough is mixed and transferred to a dough developer through dough pump. Once the dough is developed with intense energy input, it is pumped to an extruder where it is extruded into the greased baking tin. It is then proofed and baked as per the conventional procedure.

Amflow Process

The Amflow method uses a flour based brew/liquid sponge instead of non-flour brew used in the Do Maker process. Flour brew consists of some flour, water, yeast, salt and sugar. The use of part of the flour in the brew help in cost saving in ingredients since flour is fermented rather than sugar. This also helps to improve the flavor. After fermentation for about 2 - 3 hours, the ferment is pumped into the premixer along with melted fat, oxidants, sugar solution, remaining flour, water and other ingredients. The mixed dough is pumped into the developer through a dough pump. The dough is developed by mincorporating the required energy. Continuous bread making system reduces processing time, floor space and some labour. The bread made by these methods has fine uniform grain structure. These methods are used for very large scale production involving 2000 - 3000 kg dough per hour.

EVALUATION OF BREAD

Bread Faults

Bread faults, which can be many in number, may be broadly divided into two main groups, namely External Faults and Internal Faults. These faults may originate from poor quality of ingredients or from a faulty production process, or a combination of both. The occurrence of bread faults will not be frequent and their effects not severe. If proper precautions are taken to ensure, use of proper quality ingredients, use of right formulations, adherence to proper process conditions at different stages of production and that equipment are kept at optimum operating efficiency. It is convenient to list them according to bread quality characteristics and indicate various possible causes and remedial actions for the benefit of bakers.

External Faults

Nature of fault sand some probable causes to be corrected

Lack of Volume

a) Insufficient Yeast

b) Insufficient water absorption

c) Too much salt

d) Excess of diastatic activity in flour

e) Over-mixing or under-mixing of dough

f) Over- fermented for under- fermented doughs

g) Too Iow a dough temperature

h) Insufficient final proof

i) Improper humidity conditions during proofing

j) Insufficient dough weight for baking tin size

k) Excessive oven temperature

l) Weak flour

Excessive Loaf Volume

- a) Insufficient salt
- b) Over-aging of dough
- c) Over proofing
- d) Too much dough for pan size
- e) Low oven temperature

Pale Crust Color

- a) Insufficient sugar
- b) Deficiency of diastatic activity
- c) Too high a fermentation temperature
- d) Skinning of dough during proofing
- e) Dry proof box
- f) Over- fermentation of dough
- g) Low oven temperature
- h) Low top heat in oven

- i) Too short a baking period

Crust Color Too Dark

- a) Excessive sugar in formula
- b) Immature dough
- c) Too high an oven temperature
- d) Excessive top heat in oven
- e) Over-baking
- f) Oven atmosphere too dry
- **Crust Blisters**
- a) Improper mixing
- b) Immature dough
- c) Incorrect moulding
- d) Excessive steam in proof box
- e) Excessive oven steam leading to condensation

Excessive Crust Thickness

- a) Insufficient sugar
- b) Deficient diastatic action
- c) Skinning of dough during proofing
- d) Over-aged dough
- e) Low oven temperature
- f) Too long a baking period

Shell Tops

- a) Immature flour freshly milled
- b) Deficiency in diastatic action
- c) Excessively stiff dough
- d) Immature dough
- e) Insufficient Final proofing
- f) Dry oven steam
- g) Skinning of dough during proofing

- **Uneven Shape**

- a) Flour with high maltose figure

- b) Excessive amylase addition

- c) Improper moulding

- d) Improper panning placement in baking tin

- e) Improper final proofing

- f) Improper depanning and handling of hot bread

- g) Use of blunt slicing blades

- h) Damages during slicing and packing

Internal Faults

Nature of fault sand some probable causes to be corrected

Dull Crumb Color, lacking brightness

a) Improper dough mixing

b) Too long final proof

c) Over fermentation of doughs

d) Improper dough development

e) High fermentation temperatures

f) Excessive use of dusting flour

g) Excessive use of oil at divider

h) Improper moulder setting

Coarse Grain (Non-uniform cellular structure)

a) Weak Flour

b) Very stiff doughs

c) Too high water absorption (slack doughs)

d) Over - mixing

e) Under fermentation

f) Improper moulding

g) Insufficient dough weight for pan size

Poor Texture (Thick cell walls)

a) Very stiff doughs

b) Improper mixing

c) Excessive amylase action

d) Over fermented doughs

e) Skinning of sponge or dough during fermentation

f) Excessively high proof box temperature

g) Over-proofing

h) Insufficient dough weight for pan size

i) Incorrect use of bread improver

Poor Flavor

a) Low quality ingredients (flour, yeast, etc)

b) Insufficient salt

c) Unbalanced formula

d) Over fermentation / Under fermentation

e) Excessive use of yeast

f) Over proofing

g) Under baking

h) Poor bakery hygiene

i) Use of old trough and pan greasing material

j) Presence of external odors

Poor Keeping Qualities

a) Unbalanced formula

b) Poor quality ingredients

c) Improper mixing

d) Over fermentation / Under fermentation

e) High dough temperature

f) Oven final proofing

g) Low oven temperature

h) Improper bread cooling conditions

Holes in Bread

a) Use of freshly milled flour

b) Weak flour

c) Insufficient salt

d) Improper mixing

e) Excessively stiff doughs

f) Over fermented doughs

g) Skinning of sponge or dough

h) Improper molding

i) Excess divider oil

j) Too high a proofing temperature

CAKE MAKING PROCESS

Main ingredients in a cake

Flour, sugar, eggs, butter or oil or margarine, a liquid, and leavening agents, such as baking soda or baking powder.

Sugar batter method

The sugar batter is based on the emulsion of oil in water with air bubbles being trapped in the fat phase while other ingredients are dissolved in the water phase. The fat and sugar are creamed dependent on the temperature and creaming quality of the fat to produce a light mix.

Flour batter method

Equal quantity of flour and fat are creamed together. The weight of broken eggs and its equivalent weight of sugar is taken. Egg is beaten while adding sugar gradually till it is light and frothy. This is added to creamed mixture lightly avoiding over beating.

Blending method

Basically stir together and go, the blended method is the easiest of all cake-prep types. Blended cakes are typically made with oil rather than butter, since oil is much more easily incorporated with the rest of the ingredients.

Boiling method

In this method egg and sugar are beaten to a stiff froth over a water bath. In whipping of eggs and sugar, aeration takes place. The fat is melted. The flour is folded in the egg mixture lightly adding melted fat alternatively with flour.

All in one method

Exactly as the name suggests, all the measured ingredients go into the bowl together and the mixing is done in a matter of minutes. Try making this moist and lemony drizzle cake using the all in one method. It's as simple as weighing out the ingredients, beating them together and then baking.

Foaming method

A foaming method is any method in which the eggs are whipped or beaten to incorporate air before they are folded into the rest of the batter. When you use a foaming method, it is vital that all ingredients and equipment are assembled and receive any preliminary treatment before you begin to mix the batter.

Characteristics of Cakes

Chief characteristics of cakes can be classified as internal and external characteristics. The external characteristics include volume, crust colour, symmetry of form and character of crust. The internal characteristics include grain, crumb colour and sensory parameters such as taste, aroma and texture.

External characteristics

- *Volume:* It depends on consumer preference. It should be well risen with slight convex top surface and should not appear too small or too large for its weight.
- *Crust colour:* Pleasing golden brown colour is desirable. Too dark or too light or dull colour is not desirable. Crust must have a uniform colour, free from dark streaks or sugar spots or grease spots.
- *Symmetry of form:* Cakes should have symmetrical appearance. Peaking, crack on top surface, low sides, sunken or high centre, burst, caved in bottom or uneven top are undesirable characteristics of cakes.
- *Character of crust :* Crust should be thin and tender. It should not be rubbery, sticky or over moist, too tender, tough or busty crust indicates poor quality of cakes.

Internal Characteristics

- *Grain:* The grain is the structure formed by the extended gluten strands including the area they surround. Grain will vary according to type of cake. Uniformity of the size of cells and thin cell walls are desirable qualities. Coarseness, thick cell wall, uneven size of grains, large holes and tunnels are indicative of poor grain. Grains should not be too open or too close.
- Colour of Crumb*:* It should be lively, lustrous and uniform colour. It should be free from any streaks or dark patches. Grey, non uniform, dark, light or dull colour crumb are undesirable.
- *Aroma:* Pleasant, rich, sweet and natural aroma is desired. Flat, misty, strong or sharp aroma is indicative of poor quality of cake.
- *Taste:* It should be pleasant, sweet and satisfying without any after taste or foreign taste. Salt and soda in excessive amounts affect the taste adversely.

- Texture: Texture denotes the pliability and smoothness of the crumb as felt by sense of touch. It depends on the physical condition of crumb and type of grain. A good texture is soft and velvety without weakness and should not be crumby. Rough, harsh, too compact, lumpy or too loose texture is not.

CAKE FAULTS AND CAUSES

- ***CAKE FAULT: SIDE OF THE CAKE CRUNCHY/BURNT***
- ***REASON***: This usually happens when you leave your cake in the oven for too long. Other factors include:
- Too much fat used to butter pan
- Oven temperature too hot
- Butter not suitable for baking
- Cake tin not sufficiently lined
- ***REMEDY***
- Do not over bake your cakes
- Check your oven temperature
- Butter and flour or line your pan well
- Check your baking ingredients whether it is suitable for baking.

CAKE FAULT: CAKE STUCK TO THE PAN

- ***REASON***: This usually occurs when the pan used is not greased well or when the cake is cooled in the pan for too long.
- ***REMEDY***
- Grease your pan well
- Let your cakes cool in the pan for just 15 mins, then turn them over to a cooling rack to complete the cooling process

CAKE FAULT: CAKE TOO DARK

REASON:

- Oven temperature too hot
- Incorrect amount of water/liquid
- Excessive sugar
- ***REMEDY:***
- Check your oven temperature
- Follow the recipe correctly

CAKE FAULT: CAKE BURNED ON TOP

REASON

- Oven temperature too hot
- Incorrect amount of water/liquid
- ***REMEDY:***
- Check your oven temperature
- Follow the recipe correctly

CAKE FAULT: CAKE SHINY AND STICKY

- ***REASON***
- Oven temperature too cool
- Not baked long enough
- Too much sugar in recipe
- ***REMEDY:***
- Check your oven temperature
- Make sure your cakes are well-baked
- Follow the recipe correctly
- ***CAKE FAULT: CRUST TOO THICK***

- ***REASON:***
- Excessive baking time
- ***REMEDY:***
- Do not over bake your cakes
- ***CAKE FAULT: CAKE SHRINKS***
- ***REASON:***
- Excessive liquid
- Oven temperature too hot
- Improper mixing procedure
- Cake baked too long
- ***REMEDY***
- Follow the recipe correctly
- Check your oven temperature
- Do not over bake your cake
- Do not over mix the cake
- ***CAKE FAULT: CAKE ROSE UNEVENLY***
- ***REASON:***
- Flour was not blended well into the main mixture
- Oven temperature uneven
- Oven temperature too high
- ***REMEDY***
- Mix your batter well
- Check your oven temperature

INTERNAL CAKE APPEARANCE

- ***CAKE FAULT: CAKE VERY DENSE/ DENSE GRAIN***

REASON

- Enough air wasn't beaten into the cake
- Eggs added too quickly
- Not enough rising agent
- Excessive liquid
- Improper mixing
- ***REMEDY***
- Mix your batter well
- Follow the recipe correctly
- Mix your batter well
- ***CAKE FAULTS: SUNK FRUITS***

REASON:

- Fruits are too large/heavy
- Sugary syrup on outside of fruit was not washed off causing fruits to slide through mixture when heated
- Cake mixture over beaten/ too wet so could not hold fruit in place
- Oven temperature too hot
- ***REMEDY***
- Coat your fruits with flour before adding them to your batter
- Check your oven temperature
- If the fruits are too large, cut them to smaller bits before adding to your batter
- Do not over mix your batter
- Wash your fruits properly

- ***CAKE FAULTS: BURNT ON TOP, ISN'T COOKED IN THE MIDDLE***

  REASON:

- Cake tin too small
- Oven temperature too hot
- ***REMEDY:***
- Use the right pan size
- check your oven temperature
- ***CAKE FAULT: DRIES OUT TOO SOON***

  REASON:

- Excessive baking time
- Insufficient liquid
- Improper mixing procedure
- Dry weather
- ***REMEDY:***
- Reduce your baking time
- Mix your batter properly
- Follow the recipe correctly
- Wrap your cakes with cling film to avoid drying
- ***CAKE FAULT: COARSE AND IRREGULAR GRAIN***

  REASON:

- Improper mixing procedures
- Stiff batter
- Oven temperature too cool
- Batter turned too much

- ***REMEDIES***
- Mix your batter correctly
- Follow the recipe correctly
- Check your oven temperature
- ***CAKE FAULTS: OFF COLOR CAKES***

  REASON:
- Unclean equipment
- Oven temperature too cool
- Improper mixing procedure
- ***REMEDY***
- Check your oven temperature
- Mix your batter well
- Use clean equipment
- ***GENERAL FAULTS***
- ***CAKE FAULT: BATTER OVER FLOWED***
- ***REASON***
- Wrong adjustments to recipes
- Cake tin too small
- ***REMEDY:***
- Use the right size of pan
- Adjust the recipe properly
- ***CAKE FAULT: POOR FLAVOR***

  REASON:
- Improper mixing procedure
- Faulty baking conditions

- Improper cleaning of equipment
- ***REMEDY:***
- Mix your batter properly
- Check your baking conditions
- Clean your equipment well
- Use pure flavors instead of imitation
- ***CAKE FAULT:CAKE TOO TOUGH***

  REASON
- Excessive mixing
- Batter too stiff(insufficient water)
- ***REMEDY:***
- Do not over mix your batter
- Follow the recipe correctly
- ***CAKE FAULT: LACKS BODY STRUCTURE***

  REASON:
- Excessive mixing
- Excessive liquid
- ***REMEDY:***
- Mix your batter properly
- Follow the recipe correctly

UNIT V (10L+3T)

ICING

Types of buttercream

There are three types of buttercreams that are most often used: American Buttercream, Swiss Meringue Buttercream, and Italian Meringue Buttercream. There are a few other types of buttercream that are less commonly used like French Buttercream, German Buttercream, and a very new style of buttercream called G.G.

Royal icing

Royal icing is a hard white icing, made from softly beaten egg whites, ici ng sugar, and sometimes lemon or lime juice. It is used to decorate Christmas cakes, wedding cakes, gingerbread houses, cookies and many other cakes and biscuits. It is used either as a smooth covering or in sharp peaks.

Almond icing -Marzipan

Marzipan is a confection consisting primarily of sugar or honey and almond meal, sometimes augmented with almond oil or extract. It is often made into sweets; common uses are chocolate-covered marzipan and small marzipan imitations of fruits and vegetables.

Fondant icing

Fondant icing, also commonly referred to simply as fondant, is an icing used to decorate or sculpt cakes and pastries. It is made from sugar, water, gelatin, vegetable fat or shortening, and glycerol.

Gum Paste icing

- Make space in the center and add egg whites, salt and vanilla extract.
- Mix well until no lumps.
- Add tylose or CMC powder.
- Mix for a minute or two until sticky.
- Now add more powdered sugar – until you are able to form a ball.

- Do not add too much powdered sugar as the gum paste can dry out.
- You can transfer the mix to a working board to mix well.
- Next, knead in the veg shortening.
- You want the mixture to be soft, slightly sticky – you can add more powdered sugar later too.
- Divide the paste into small portions and wrap well in plastic wrap/bag
- Then place them all in a ziplock bag and into an airtight box.
- Let rest in the fridge overnight.
- Next day – let rest at room temperature.
- knead with a little veg shortening if needed powdered sugar too.
- Use as needed for any project.

American frosting icing

- Ensure your cake is ready before you start, as this icing begins to set very quickly. Bring to the boil a saucepan of water large enough to hold a heatproof bowl. Place the egg whites in the bowl and whisk with a hand-held electric beater until very stiff.
- In a separate saucepan over a medium-high heat, dissolve the sugar in the water and boil for 5-10 mins until the liquid is thick and syrupy and has reached the 'thread' stage – when the last few drops that fall from a metal spoon dipped into the syrup come off in one long, quite thick and syrupy thread.

- Pour the boiling syrup over the stiffly beaten egg whites, whisking all the time with the hand-held beater. Place the bowl in the saucepan of simmering water. Continue to whisk over the water for 10-15 mins until the icing is snow white, very thick and meringue-like.
- Spread the icing quickly over the cake with a palette knife, regularly dipping the knife into a jug of boiling water. The icing sets very quickly at this stage, so speed is essential.

Water Icing

- Heat up the water until warm, not hot. Put the icing sugar into a small or medium bowl and add water. Mix together until the icing becomes thick enough to coat with a back of a spoon. If necessary, add more water (a drop at a time) until it is thick/ thin enough to use.

Glaze icing

- Pour canned or premade frosting into a small microwave-safe bowl. Microwave the frosting on high for about 30 to 45 seconds. Open the microwave and stir the frosting every 10 seconds or so to check the consistency. The glaze is ready when it is slightly translucent and loose enough to pour.

COOKIES

Difference between biscuits and cookies

- The first difference between English biscuits and cookies is the way they are made. Much like cake, cookies are made from a soft, thick dough and are denser than an English biscuit. When they are finished, cookies are larger, softer, and chunkier than their biscuit.

Mixing Methods for Cookies

- Most cookie doughs are mixed by the creaming method for quick breads and cake batters. Because the cookie dough contains less liquid than quick breads or cakes, the liquid and flour need not be added alternately. Cookies can be leavened with baking soda, baking powder, or just air and steam. Most cookies are high in fat, which contributes taste and tenderness and extends shelf life.
- **Types of cookies**
- Type 1: Bar Cookies.
- Type 2: Drop Cookies.
- Type 3: Rolled Cookies.
- Type 4: Pressed Cookies.
- Type: 5 Refrigerator Cookies or Ice Box Cookies.
- Type 6: Wafer Cookies.

Procedure for making cookie doughs

- Measure all ingredients carefully.
- Cream the fat and sugar together to incorporate air and to blend the ingredients completely. Add the eggs gradually, scraping down the bowl as needed.
- Stir in the liquid ingredients.
- Stir in the flour, salt, spices and leaveners.
- Fold in any nuts, dried fruit, chocolate chips.

Bar Cookies

Bar cookie dough is pressed or layered in shallow pans and cut into portions after baking, usually squares or rectangles to avoid waste or scraps. This category, also known as sheet cookies, contains a wide variety of layered or fruit filled.

Drop Cookies

- Drop cookies are made from a soft dough that is spooned or scooped into mounds for baking. Although uniform appearance is not as important for drop cookies as for other types, uniform size and placement results in uniform baking time. A portion scoop is recommended for portioning the dough.

Cut-Out or Rolled Cookies

- Cut out or rolled cookies are made from a firm dough that is rolled out into a sheet and then cut into various shapes before baking. A seemingly infinite selection of cookie cutters is available, or you can us a paring knife or pastry wheel to cut the dough into desired shapes. Cut out cookies are usually baked on an ungreased pan to keep the high-fat dough from spreading.

Pressed Cookies

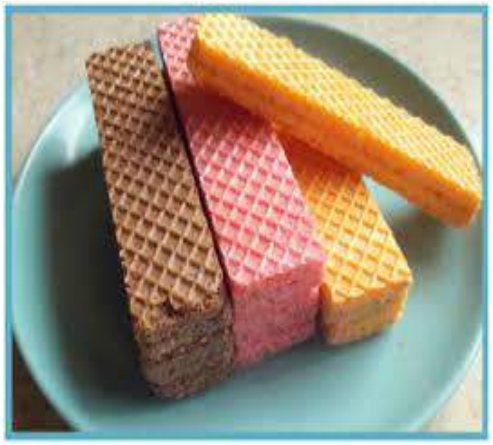
- Also referred to as bagged or spritz cookies, these products are made with a soft dough that is forced through a pastry tip or cookie gun. Pressed cookies are usually small, with a distinct, decorative shape. Doughs for pressed cookies often include eggs as their only liquid. Eggs, which act as a toughner, contribute body and help the cookies retain their shape.

Icebox Cookies

- Icebox cookies are made from a dough that is shaped into logs or rectangles, chilled thoroughly, then sliced into individual pieces and baked as needed.
- Icebox cookies can be as simple as a log of chocolate chip dough or as sophisticated as elegant pinwheel and checkerboard cookies assembled with two colors of dough. This method usually produces uniform, wafer like cookies with a crisp texture.

Wafer Cookies

- Wafer cookies are extremely thin and delicate. They are made with a thin batter that is poured or spread onto a baking sheet and baked. Then, while still hot, the wafer is molded into various shapes. The most popular shapes are the tightly rolled cigarette, the curved shape, and the cup-shaped tulip.



Faults and remedies of Cookies

- Dough is too sticky to roll if it has too little flour. Cover and chill dough.
- Dough becomes too dry if it contains too much flour. Dribble in water until the dough reaches desired consistency.
- Cookies crumble and become too dry and hard if the dough is excessively mixed.
- Stop mixing when the dough is just mixed. Do not overdo it.
- Excessive liquids and salt make cookies hard.
- Too less fat results in hard cookies. Over baking also makes cookies hard.
- Over mixing of the dough, over baking, too much water or a lack of fat or excess of dry fruits/coconut- spoil the quality.
- Excessive salt can also cause your cookies to be hard.
- When dry fruits are to be used, soak them in little water for few minutes to prevent moisture pick up from the formula.
- Cookies stick to baking pans if they are still hot from the oven. Let the cookies cool on the pans for a few minutes before transferring to wire racks.
- Use cookie or parchment paper to line pans. Light grease application can also be followed but cookies spread more on greased sheets and therefore some people prefer parchment paper.
- Cookies bake unevenly if dough is not rolled or portioned to a consistent thickness or size.
- Cookie dispensers are useful in maintaining the size of cookies besides giving attractive shapes.
- Cookies appear oily if not enough flour or too much fat is used. Do not substitute shortening, or margarine for vegetable oil.
- Cookies become too flat, spread and thin out while baking: Use shortening instead of butter. Make smaller cookies, they’ll puff better.

- Chill dough, form cookies and then chill on pans before baking.
- Bake cookies a few minutes longer than suggested and immediately remove them to wire racks to cool to make crispier cookies. Use more white sugar than brown to give more crispiness. Use a little bit more liquid in the batter, that will help cookies to spread more, and thus be thinner and crispier.

PASTRIES

Types of Pastry

There are five basic types of pastry (a food that combines flour and fat); these are shortcrust pastry, filo pastry, choux pastry, flaky pastry and puff pastry.

Shortcrust pastry

- Shortcrust pastry is a type of pastry often used for the base of a tart or pie. Shortcrust pastry can be used to make both sweet and savory pies such as apple pie, lemon meringue or chicken pie.
- Shortcrust pastry recipes usually call for twice as much flour as fat by weight. Fat (lard, shortening, butter or full-fat margarine) is rubbed into plain flour to create a loose mixture that is then bound using a small amount of ice water, rolled out, then shaped and placed to create the top or bottom of a flan or meat pie. Often, equal amounts of butter and lard are used to make the pastry, ensuring that the ratio of the two fat products is half that of the flour. The butter is employed to give the pastry a rich flavor, while the lard ensures optimum texture.

Puff pastry

▶ It is also known as ***pâte feuilletée***, is a flaky light pastry made from a laminated dough composed of dough (*détrempe*) and butter or other solid fat (*beurrage*). The butter is put inside the dough (or vice versa), making a *paton* which is repeatedly folded and rolled out before baking.

▶ The gaps that form between the layers left by the fat melting are pushed (leavened) by the water turning into steam during the baking process.

Flaky pastry

▶ **Ingredients**

▶ 225g/8oz plain flour

▶ pinch of salt

▶ 80g/3oz lard

▶ 80g/3oz butter

▶ **Method**

▶ Mix the flour with the salt and rub in half of the lard. Add enough cold water to bring the flour to a soft dough.

▶ Mix together the rest of the lard and the butter.

- Roll out the dough to make a rectangle 12.5 x 25cm/5 x 10in.
- Dot one third of the butter/lard mixture over two-thirds of the rectangle. Fold the third without any fat on it over the middle third of the pastry. Bring the other third on top. Seal the edges with a rolling pin and turn the dough 90 degrees. Chill for 10 minutes.
- Repeat stage 4 with half of the rest of the fat and then repeat one more time with the remaining fat. Chill for 10 minutes after each folding.
- Roll and fold one more time without any fat and then chill for 30 minutes.

Ingredients

Ingredient Checklist

- 2 cups all-purpose flour, plus more for kneading
- 5 teaspoons olive oil
- ½ teaspoon fine salt
- 2 teaspoons white wine vinegar
- ¾ cup warm water (110 degrees F (43 degrees C))

Starch Mixture:

- ½ cup cornstarch
- 2 tablespoons all-purpose flour

Instructions Checklist

- **Step 1**

Place 2 cups flour in a mixing bowl; make a well in the center. Drizzle in olive oil and add salt; add white wine vinegar and warm water. Mix until dough just comes together and pulls away from the sides of the bowl, 1 or 2 minutes. Transfer dough ball to a lightly floured work surface.

- **Step 2**

Knead until dough is smooth, using just enough flour to keep it from sticking to the work surface or your hands, 2 or 3 minutes. Continue to knead until dough is supple and elastic, about 5 more minutes. Wrap dough ball in plastic wrap and let rest at room temperature, 1 to 2 hours.

- **Step 3**

Divide dough into 20 (20 gram) portions using a kitchen scale; roll each portion into a ball. Place on plate and cover with plastic wrap to prevent dough balls from drying out while you begin to roll them out. Work in batches of 5.

- **Step 4**

Mix cornstarch and 2 tablespoons flour together in a bowl. Dust a work surface and the first dough ball with the cornstarch mixture. Flatten out the dough ball and roll out into a circle, about 5 inches in diameter. Dust again with cornstarch mixture. Set circle to one side. Roll out 4 more dough balls to about the same diameter and stack them on the first one, dusting each layer with more of the cornstarch mixture to keep them from sticking together.

- **Step 5**

When you have 5 circles, roll out the stack to a larger circle about double in size, turning as you go to maintain a round shape. Separate each layer and lay out the circles. Re-apply more cornstarch mixture where needed and restack them. Roll again until the 5-layer stack is paper thin, about 10 to 12 inches in diameter. Place on a sheet of parchment paper; top with another piece of parchment. Gently roll up the dough; wrap in plastic wrap. Refrigerate.

Choux Pastry

It can be used in anything from cream puffs, profiteroles, and eclairs to churros, croquembouche, French cruller donuts, choux beignets, and gougères.

- **Instructions** Begin by cutting 1/4" butter. you'll have about 2 tablespoons butter. Set them (and the remaining butter) aside. You'll be using the 2 tablespoons butter immediately, but won't need the remaining butter until after you've made the dough.
- In a large bowl, whisk together the flour, sugar, yeast, salt, and cardamom. Add the 2 tablespoons cold butter, working it in with your fingers until no large lumps remain. This step coats the flour a bit with fat, making the pastry a tiny bit more tender.
- Add the vanilla, milk, water, and eggs. Mix and knead to make a cohesive, but quite sticky dough. This is easily done in a bread machine set on the dough cycle; or in a mixer. If you use a mixer, the dough won't completely clean the bowl; it'll probably leave a narrow ring around the side, and stick at the bottom.
- Scrape the dough into a ball, and transfer it to a floured work surface. Cover it with plastic wrap, and let it rest for 10 minutes while you prepare the butter.

Danish Pastry

- **Ingredients**
- Dough
- 32 tablespoons (454g) unsalted butter, at cool room temperature, 65°F to 68°F
- 5 1/2 cups (659g) King Arthur Unbleached All-Purpose Flour
- 1/3 cup (67g) granulated sugar
- 4 teaspoons instant yeast
- 2 1/2 teaspoons salt, if you use salted butter, reduce this to 1 1/2 teaspoons salt
- 1/2 to 1 teaspoon cardamom, optional; for traditional flavor
- 1 teaspoon vanilla

- 1 cup (227g) milk, cold
- 1/3 to 1/2 cup (76g to 113g) lukewarm water*
- 2 large eggs
- *Use the greater amount in winter, or in a dry climate; the lesser amount in summer, or when it's humid out.
- Cheese filling
- 1/2 cup (113g) cream cheese
- 1/2 cup (113g) cottage cheese or ricotta cheese
- 3 tablespoons (35g) granulated sugar
- 1 large egg
- 1/4 teaspoon salt
- Fruit filling
- about 1 to 1 1/4 cups (298g to 369g) jam, preserves, or canned fruit pie filling
- Topping
- 1 large egg white, beaten lightly with 1 tablespoon cold water
- Glaze
- 1 1/2 cups (170g) confectioners' sugar or glazing sugar
- 2 to 2 1/2 tablespoons (28g to 35g) water or milk, enough to make a "drizzle-able" glaze
- pinch of salt
- crushed nuts, optional; to garnish.

Procedure

- **Step 1**

In a medium bowl, cream together the butter and 2/3 cup of flour. Divide into 2 equal parts, and roll each half between 2 pieces of waxed paper into a 6 x12 inch sheet. Refrigerate.

- **Step 2**

In a large bowl, mix together the dry yeast and 3 cups of the remaining flour. In a small saucepan over medium heat, combine the milk, sugar and salt. Heat to 115 degrees F (43 degrees C), or just warm, but not hot to the touch. Mix the warm milk mixture into the flour and yeast along with the eggs, and lemon and almond extracts. Stir for 3 minutes. Knead in the remaining flour 1/2 cup at a time until the dough is firm and pliable. Set aside to rest until double in size.

- **Step 3**

Cut the dough in half, and roll each half out to a 14 inch square. Place one sheet of the cold butter onto each piece of dough, and fold the dough over it like the cover of a book. Seal edges by pressing with fingers. Roll each piece out to a 20x 12 inch rectangle, then fold into thirds by folding the long sides in over the center. Repeat rolling into a large rectangle, and folding into thirds. Wrap in plastic and refrigerate for at least 30 minutes.

- **Step 4**

Remove from the refrigerator one at a time, and roll and fold each piece two more times. Return to the refrigerator to chill again before shaping. If the butter gets too warm, the dough will become difficult to manage.

- **Step 5**

To make danishes, roll the dough out to 1/4 inch thickness. The dough can be cut into squares, with a filling placed in the center. Fold 2 of the corners over the center to form a filled diamond shape. Or, fold the piece in half, cut into 1 inch strips, stretch, twist and roll into a spiral. Place a dollop of preserves or other filling in the center. Place danishes on an ungreased baking sheet, and let rise until doubled. Preheat the oven to 450 degrees F (220 degrees C). Danishes can be brushed with egg white for a shiny finish.

- **Step 6**

Bake for 8 to 10 minutes in the preheated oven, or until the bottoms are golden brown.

EQUIPMENT USED IN BAKERY

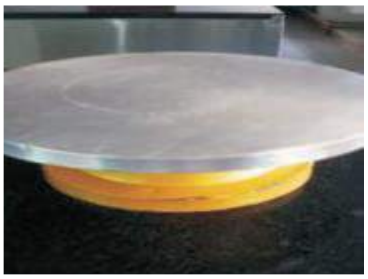
Small Equipment used in Bakery:

Measuring Jug: An equipment used for measuring all the types of liquids in the liter.

Biscuit Cutter: It is used for the cutting of different types of biscuits. These are available in different fancy shapes.

Wooden Spoon: It is used at the time of cooking, especially sugar based products.

Wire Whisker: It is used for whisking egg and cream and helps to aerate with air.



Turn Table: It is used while icing on the cakes and pastries.

Scrapper: It is used while creaming and dough making to collect the raw material.

Pizza Cutter: It is a cutter used for cutting the pizza and sometimes to cut the rolled dough.

Doughnut Cutter: It is used for cutting the rolled doughnut dough.

Icing Comb: It is used while doing the cream icing on the cakes.

Rolling Pin: It can be of different material and of different lengths, used for rolling the dough.

Nozzle Set: It is used for the decorative work on cakes, cookies and different products.

Strainer: It is used for straining the liquids to remove impurities.

Spatula: It can be of wooden, plastic or rubber material and is used for removing batter or mixture from the machine bowl.

Piping Bag: It is used while piping the batters, cookies mix, cream icing etc.

Basin: A large bowl used for making of dough, batter or storage of food.

Bread Mold: A mold used for preparing the molded breads.

Tart Mold: A mold used for the preparation of tarts.

Muffin Tray: A kind of baking tray for baking the batter of muffins.

Caramel Custard Mold: A mold used for the making of Caramel custard.

Fancy Mould: It is used for the preparation of different fancy cakes.

Cake Mould: It is used for baking the cake batter.

Flan Mould: An equipment used for the making of flans.

Laddle: An equipment used for the portioning of raw material and also for cooking.

Pallet Knife: A knife with parallel and without any sharp edges. Used for the different products like cakes, icing etc.

Bread Knife: A long knife with one edge with the grooved like saw, used for cutting of cakes and breads.

Measuring Spoon: It is used for measuring the dry ingredients in small quantity like 1.5 gms, 2.5 gms, 5 gms, 10 gms.

Baking Tray: It is used for the different baking like-breads, biscuits, pizza etc.

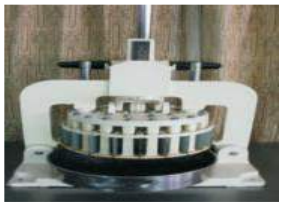
Large Equipment used in Bakery and Confectionery:

Weighing Scale: It is used for the weighing the raw materials in the unit of grams and kilograms.

Single Deck Oven: It is an oven with the single deck used for baking.

Table Top Planetary Mixer:

An equipment with the three attachments - kneader, whisker and creamer for different methods of preparations in bakery and Confectionery.



Dough Divider: An equipment used for dividing the dough into equal weights.

Two Deck Oven: It can be used for baking two different products at different baking temperatures.

Tray Rack: A rack to place the baked products and baking trays.

Bread Slicing Machine: A machine used for the slicing of the bread and cake loafs.

Brick Oven: An old style oven made of bricks, where wood and charcoal to be used for heating the oven.

Spiral Kneader: A kneader used for the bulk kneading.

Proofing Chamber: A cabinet used for proofing the dough, having a humidity controller.

Flour Sifter: An equipment used for the shifting flour in bulk quantity.

Sugar Grinding Machine: A sugar grinder for bulk grinding of sugar.

Dough Sheeter: An equipment used for the sheeting of dough to a desired thickness.

Packing Machine: An equipment used for the packing of prepared products which is for the sale.