FOOD PRODUCTION THEORY (DFP01)

(DIPLOMA IN FOOD PRODUCTION)

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LESSON 1

History and Evolution of Cookery

1.0 Objectives

- To introduce the historical progression leading to cookery
- To discuss the relationship of art and science in Culinary preparation
- To explain the aims and objectives of cooking

Contents

1.1 Introduction

Cookery is defined as a “chemical process”, the mixing of ingredients, the application and withdrawal of heat, decision-making, technical knowledge and manipulative skills. In the more advanced stages, a further element occurs that of creativity. Cookery is considered to be both an art and technology.

Food preparation is a modern term in professional cookery. It denotes preparation and cooking. It follows a flow pattern that commences with the purchasing and selection of material, their handling, processing and the ultimate presentation of the dishes to the customer, where “Food Service” takes over. In French, the word “Cuisine” denotes the art of cooking – preparing dishes, and the place – the kitchen in which they are prepared.

1.2 Culinary Preparation - the Art and Science

It is not solely the artful manipulation and combination of food which results in good tasting food. Development of pleasing textures and flavors involves the interaction of the various foods

and preparation methods used. The preparation we discuss in this text in one sense, goes for beyond the preparation of food stuffs needed for humankind to survive. In another sense our discussion will touch on nutritional aspects of preparation which are important to the survival of the consumer. The nutritional value of the food prepared must be considered. This part of food preparation can be considered to be the science. Balancing the art and science is the goal of the culinarian. Producing food which is nutritious and good tasting requires both art and science.

1.3 Origin and Evolution

The beginning of cookery and storing of food is greatly influenced by the growth of civilization. Human beings eat to survive; it must be assumed that from the beginning of time, eating food was the primary focus of humanity. Cooking must have started when a piece of meat accidentally fell into the fire, which was lighted for warmth. This piece of meat must have tasted better than the raw ones and so “cooking” started.

Culinary development initially was tied to the developments within an individual country or region. Ideas were exchanged when different races came into contact with each other. This resulted in the development of food preparation from one country to another.

Rome was the region that basically played a great role in the development of cuisines all over the world. Romans conquered the major part of the world and wherever they were ruling they took along with their cuisine and also developed the regional cuisines also.

France ultimately turned out to be the country that has become a major force in culinary aspects, have recognized the importance of cooking and reached a stage where it is at present. Difficult chefs and culinarians have revolutionized the food preparation process and the food service aspects also. Chefs like **Francois Pierrs de la Varenne, Taillevent, Guillanme** have mastered in the art and started the tradition of culinary books and guides. Of all the chefs, **Escoffier,** developed as the master, he created the **“French School of Culinary Arts- La Cuisine Classique:.** He was regarded as the Emperor of World’s Kitchens. He brought about changes in the kitchen, menu and the preparation itself. He has decided to improve the working conditions and the stature in society of a chef and has successfully done so. His book “**Le Guide Culinaire**” is still considered as one of the premier guides of cooking. His innovations have made culinary preparation an art and a science. The emphasis of any preparation was laid on quality, not quantity.

His rules include:

- All cooks are required to wear the newly fashioned checkered trousers and white jacket.
- He required his cooks to bath regularly.
- He insisted that his cooks acquire schooling so they could better themselves.
- He was the first to move the kitchen from the traditional location in the unventilated basement.
- He discouraged smoking and drinking alcohol by members of his staff.
- One of his great achievements was the development of the kitchen brigade. This division of the kitchen into stations elimi9nated much of the confusion traditional in the kitchen.
- He began the process of standardizing recipes and menus.

What all Escoffier started hasn't stopped there. Various developments started taking place since the twentieth century, which has brought changes in equipment, fuel. Preservation of food changed the whole picture.

Throughout the 20th century, the kitchen and menu have been streamlined. Food preparations have started to be seen not only as per the taste, but also the nutritional aspect. Speed of production has increased due to various equipment etc.

1.4 Modern Developments

Today's kitchens look much different from those of Scoffer's day, even though our basic cooking principles are the same. Also, the dishes we eat have gradually changed due to the innovations and creativity of modern chefs. The process of simplification and refinement, to which Care me and Escoffier made monumental contributions, is still going, on adapting classical cooking to modern conditions and tastes.

Many developments in the twentieth century have led to changes in the food service industry.

Development of New Equipment : We take for granted such basic equipment as gas and electric ranges and ovens and electric refrigerators. But even these essential tools did not exist until fairly recently. The easily controlled heat of modern cooking equipment, as well as motorized food cutters, mixers, and other processing equipment, has greatly simplified food production.

Research and technology continue to produce sophisticated tools for the kitchen. Some these products, such as tilting skillets and steam-jacketed kettle, can do many jobs and are popular in many kitchens. Others can perform specialized tasks rapidly and efficiently, but their usefulness depends on volume because they are designed to do only few jobs.

Modern equipments have enabled many food service operations to change their production methods. With sophisticated cooling, freezing, and heating equipment, it is possible to prepare some foods further in advance and in larger quantities. Some large multiunit operations prepare food for all their units in a large central commissary. The food is prepared in quantity, packaged, chilled or frozen, then heated or cooked to order in the individual units.

Development and Availability of New Food Products: Modern refrigeration and rapid transportation caused revolutionary changes in eating habits. For the first time , fresh foods of all kinds- meats, fish, vegetables, and fruits-became available all year. Exotic delicacies can now be shipped from anywhere in the world and arrive fresh and in peak condition.

The development of preservation techniques-not just refrigeration but also freezing, canning freeze-drying, vacuum-packing, and irradiation-increased the availability of most foods and made affordable some foods that were once rare and expensive.

Techniques of food preservation have had another effect. It is now possible to do some or most of the preparation and processing of foods before shipping rather than in the food service operation itself. Thus, convenience foods have come into being. Convenience foods continue to account for an increasing share of the total food market.

Some professional cooks think of new convenience food products and new equipment as a threat to their position. They fear that these products will eliminate the need for skilled chefs because everything will be prepared or done by machine. However, handling convenience products

properly still requires skill and knowledge. The quality of the product as served depends on how well the cook handles it. Furthermore, many new food products as served of equipment are intended to do work that takes little or no skill, such as peeling potatoes and pureeing vegetables. Convenience foods and advanced equipment free cooks from drudgery so that they have more time to spend on those jobs that do require skill and experience.

Sanitary and Nutritional Awareness: The development of the sciences of microbiology and nutrition had a great impact on food service. One hundred years ago, there was little understanding of the causes of food poisoning and food spoilage. Food handing practices have come a long way since Escoffier's day.

Also, little knowledge of nutritional principles was available until fairly recently. Today, nutrition is an important part of a cook's training. Customers are also more knowledgeable and therefore more likely to demand healthful, well-balanced menus.

Modern Cooking Styles: All these development have helped change cooking styles, menus, and eating habits. The evolution of cuisine that has been going on for hundreds of years continues. Changes occur not only because of technological developments, such as those just described, but also because of our reactions to culinary traditions.

Two opposing forces can be seen at work throughout the history of cooking. One is the urge to simplify, to eliminate complexity and ornamentation, and instead to emphasize the plain, natural tastes of basic, fresh ingredients. The other is the urge to invent, to highlight the creativity of the chef, with an accent on fancier, more complicated presentations and procedures. Both these forces are valid and healthy; they continually refresh and renew the art of cooing.

Recent history provides an example of these trends. Reacting to what they saw as a heavy, stodgy, overly complicated classical cuisine, a number of French chefs in the late 1960 and early 1970s became famous for a style called nouvelle cuisine ("new cooking"). They rejected many traditional principles, such as a dependence on flour to thicken sauces and seasonings and shorter cooking times,. Very quickly, however, this "simpler" style became extravagant and complicated, famous for strange combinations of foods and fussy, ornate arrangements and designs. By the 1980s, many people were saying that nouvelle cuisine was dead.

It isn't dead, of course, any more than the cuisine of Escoffier is dead. The best achievements of nouvelle cuisine have taken a permanent place in the classical tradition. Meanwhile, many of the excesses have been forgotten. It is probable fair to say that most of the best new ideas and the lasting accomplishments were those of classically trained chefs with a solid grounding in the basics.

The growth of food service holds great promise for new cooks and chefs. Technology will continue to make rapid changes in our industry, and men and women are needed who can adapt to these changes and respond to new challenges. Although automation and convenience foods will no doubt grow in importance, imaginative chefs who can create new dishes and develop new techniques and styles will always be needed, as will skilled cooks who can apply both old and new techniques to produce high-quality foods in all kinds of facilities, from restaurants and hotels to schools and hospitals.

1.5 Aims and Objectives of Cooking- fonds de Cuisine

The main intention of cooking is to see that the food cooked undergoes a physical change, sometimes a chemical change and is acceptable.

A physical change occurs when a substance changes its form, color, size, but still remains the same substance, for example water changes into ice. A chemical change occurs when a substance changes its form, color or size combining so as to form an entirely new body, for example milk becoming curd.

Objectives of Cooking:

- **Cooking partially sterilizes food**. Above 40 C (104 F) the growth of bacteria falls off rapidly and in generally it ceases above 45 C (113 F). Non-spring bacteria are killed at temperatures above 60 C (140 F) for varying periods of time, e.g., to make milk safe, it is pasteurized at 63 C (145F) for 30 minutes or at 72 C (161 F) for 15 seconds.
- **Cooking helps to make food more digestible**. To facilitate and hasten digestion, so that the cooked food is absorbed by the digestive system and subsequently assimilated by the body. Complex foods are often split into simpler substances during cooking. This helps the body to absorb and utilize the food more readily than if consumed in its raw form. This is largely determined in the manner the food is cooked. Cooking breaks down the cellulose in plant food softens some of the connective tissues of meat, breaks down and gets starches present.
- **Cooking increases palatability**. It makes food more attractive in appearance and, therefore, more appetizing.
- **Cooking introduces variety**. Many different types of dishes can be prepared with the same ingredients. It helps to provide a balanced meal. Different ingredients combined together in one dish make it easier to provide a balanced meal.
- **Cooking increases availability of food**. Raw egg contains avidin which binds biotin making biotin unavailable to the body. By cooking, avidin gets denatured and biotin is available to the body.
- **Cooking concentrates nutrients**. This may be due to removal of moisture or using combination of foods or due to cooking procedures, e.g. sweets
- A physical change occurs when a substance changes its form, colour or size, but still remains that same substance, like water that changes to ice. A chemical change occurs when a substance changes its form, colour or size, combining so as to form an entirely new body, e.g., green marrow changes its colour and milk changes to curd.
- Cooking makes food more attractive in appearance and, therefore, more appetizing.
- Cooking helps to provide a balanced meal. Different ingredients combined together in one dish make it easier to provide a balanced meal.

1.6 Limitations of cooking

- Thiamine, which is heat sensitive, may be lost during cooking. Water soluble nutrients are leached into the water during cooking. Vitamin A and C content may be reduced due to oxidation and heat.

- Quality of protein may be reduced due to destruction of certain amino acids during cooking , for example bread crust has less quality of protein compared to the indeed portion.

1.7 Conclusion

This lesson is addressed to the question of what is culinary art and science. Various areas have been touched upon in an effort to convey the complexity of the issue with which this text is dealing. That issue to many people is simply considered cooking, plain and simple. However, culinary preparation, in its fullest sense, is neither plain nor simple. It requires a combination of passion and knowledge on the part of the practitioner.

1.8 Self Assessment Questions

1. Define cooking? What are the aims and objectives of cooking?
2. Describe the modern developments that significantly changed the food service industry in 20^{th} century?
3. Define the art and science of culinary preparation?

1.9 References

1. Modern Cookery –Volume I by Thangam E Phillip
2. Theory of Cookery by Krishna Arora
3. The Art and Science of Culinary Preparation by Jerald W Chesser
4. Professional Cooking by Wayne Gisslen

LESSON 2

Raw Materials

2.0 Objectives

- To introduce and discuss various kinds of raw materials used in the kitchen
- To explain the characteristics and uses of raw materials

Contents

2.1 Introduction

For the preparation of good, tasty, colorful dishes, basic knowledge of raw materials is very essential, their characteristics and the part played by them. This knowledge helps to substitute materials if necessary or rectify the taste and texture if something goes wrong. This knowledge also helps in improving the quality and gets a standard end product.

2.2 Classification of Raw materials

Raw materials are generally classified depending on the role they play in making:

- Salt
- Liquids.
- Sweetening agents.
- Fats and oils.
- Raising agents
- Thickening agents.
- Flavourings and seasonings.
- Eggs.

2.2.1 Salt: It is used in small quantities but is an essential ingredient for sweet and savoury dishes. It helps to bring out the flavour of other ingredients.

Too much ⇒ food inedible.

Too less ⇒ food insipid.

Salt is chemically Sodium Chloride. Available in all parts of the world in solid (rock salt) or solution form (sea salt)

Salt is available in three forms:

- Table salt (contains phosphate).
- Coarse or freezing salt (culinary purposes)
- Celery salt.

Uses:

- Improves the flavour of savoury dishes. When added little to sweet dishes, it enhances the flavour.
- Has a physical effect on the gluten of flour and strengthens gluten and increases its resistance to the softening effects of fermentation.
- Cauliflower, when put in salted water, makes the insects come out.
- Controlling effect on the activity of yeast in bakery products. Controls fermentation, has a marked effect on crumb, crust and colour of baked products.
- If added in water, for cooking green vegetables; helps in colour retention and enhances the taste.
- Salting, the one of the oldest popular methods of preserving ham, bacon, fish etc.
- Salt is essential for good health.

2.2.2 Liquids: Liquid is necessary to bind dry ingredients together, to dilute food, t act as a cooking medium and to thin down a gravy or sauce. Liquids are generally used for the purpose of cooking, binding and coating etc. milk, water, stock, and fruit juices are the most commonly used liquids.

Uses:

- Prevent food from burning,
- Bind dry ingredients and
- Help in maintaining the right consistency.

When too little liquid is added,

- The food does not get cooked.
- In the case of cakes, it retards the action of raising agents resulting in a hard, heavy cake.

Too much liquid results

- In a watery product
- In the case of cakes and puddings, makes them soggy.

So it is important that the correct amount of liquid should be added. For example, water and milk are used for preparing poaching liquor (court bouillon), soups, stocks, sauces, gravies, cakes and pastry mixtures and kneading of doughs etc. Buttermilk is used for curries, kadi etc.

2.2.3 Sweetening Agents: Not as necessary ingredient as salt is. Lack of it will not affect the texture of the food or the lightness of a dish. Generally, following are the types of sweetening used:

a) Sugar

b) Treacle

c) Jaggery or molasses

d) Syrups such as golden syrup, corn syrup, maple syrup etc

e) Jams

f) Honey

g) Fruit juices

Functions:

1. Low concentration of speeds the effectiveness of baker's yeast by providing an immediate, fast cooking course of nourishment for its growth – thus hastening the leavening process
2. The ability of sugar to crystallize, gives a delightful variety in cookery.
3. Sugar gives puddings, breads, buns and bread rolls a good flavor (caramel), the characteristic golden brown color, and a tender and even texture.
4. Fermentation is aided by sugar in brewing, wine-making and in the distillation of spirits.
5. Sugar has long been used as a preservative; it is an effective preservative and can dissolve in water at very high concentration.
6. It is an energy food and can be stored for a long time without getting spoilt.
7. Too much of sweetening makes food cloying and too little makes the food tasteless.

2.2.4 Fats and Oils: Fats and oils are nutritionally useful and in some form, economical sources of energy and give a satiety value to the dish. They also contribute characteristic palatability qualities of flavour and texture. They are popularly used as the medium of cooking.

Fats are solid at ordinary temperature and melt when heated. Oils are liquids at ordinary temperature. Only coconut oil solidifies at low temperature. Various fats used in cooking are;

- Lard (pig's fat).
- Suet (fat around kidneys)
- Dripping (tallow beef fat)
- Butter
- Margarine
- Ghee

- Hydrogenated fat
- Cocoa butter (for confectionery).

Oils are extracted from coconut, palm, and sesame, cottonseed, olive, peanut, mustard, corn and sunflower.

Uses of fats and oils

- Spreads – butter and margarines are used for spreads, and their function is to add flavor, nutritional value and satiety value of breads. .
- Shortenings – these are fats which shorten the gluten strands, surround them and make them more easily broken (short). It gives tenderness, richness and sheen to the crumb.
- Salad dressings – fats oils are used for various salad dressings like Vinaigrette, French etc.
- Frying media – fasts and oils are used as medium of cooking, i.e. pan roasting, frying and sautéing.
- Tempering – dals, curries, rice dishes, etc., are tempered. The fat or oil is heated to which cumin seeds or mustard, or fenugreek seeds, etc., are added and poured over the dals..

2.2.5 Raising Agents: Leavening or Raising is increasing the surface area of a dough or batter by creating within myriads of gas bubbles puffing up, thus increasing the volume and making it light. The function of a raising agent is to puff up the food so that it spreads and rises, thus making it light and close and heavy. The tiny air spaces caused by the raising agents are retained during the process of cooking. The expansion of these gases during baking increases the volume of the product and gives a desirable porous structure.

The aeration of the flour products is affected by the following:

1) Biological (yeast)
2) Mechanical (whisking, beating)
3) Chemical (baking powder)
4) Lamination (folding, rolling)
5) Combination of the above.

Biological: It is a living micro-organism and is a form of plant life. It requires for its growth, food, moisture, warmth and air. The primary function of the yeast is to convert the sugar into carbon dioxide gas, so that the dough, in which it is generated, is aerated.

Chemical: Chemical aeration is brought about by the production of carbon dioxide from the action, in solution, of an alkali and an acid in the presence of heat. The acid and alkali is correct a proportion (which is harmless to human digestion) is baking powder.

Mechanical : It is incorporating air by whisking, beating and sieving. When sugar and eggs, fat and sugar, fat and flour or any combination of these are beaten or whisked together, or flour is sieved it works as aeration.

Lamination: Lamination acts as a raising agent. In pastries – folding and rolling helps to give the lift.

Combinations: Danish pastries are a combination of aeration by yeast and by lamination. For this, rich yeast dough is made and butter is incorporated as for puff pastry.

2.2.6 Thickening Agents: Thickening agents give body, consistency and palatability, when need. They improve the nutritive value. These foods such as milk, soups, gravies, curries etc., are often improved by the addition of a thickening agent. Flavoured liquids are thickened and converted into soups, sauces, gravies, curries, bavarois, mousses, puddings etc.

Binding agents are used to form a mixture of ingredients into a cohesive mass.

Normally used examples of thickening agents include starch, agar, eggs, gelatin, coconut, tamarind, curd, poppy seeds, onion paste, coriander powder etc.

- Eggs give a firm gel when baked, and thicken, but are soft when stirred.
- Gelatin (unflavored) is used for salads, cold sweets, cold soups. When set is transparent, firm and quivery.
- Coconut is used for curries, and gives the gravy a whitish color, thickens and enhances the taste.
- Curd id used for thickening curries and it gives a whitish appearance, and a good flavor.

2.2.7 Flavorings and Seasonings: Spices and herbs give flavourings and seasoning to the dishes. The taste and acceptability of any food depend to a very great extent on the correct amounts of flavourings and seasonings.

Seasonings as such have little or no nutritive value but are valuable for they give variety to the dishes and have medicinal value.

Uses of spices and herbs:

- Helps in digestion.
- Used for medicinal purposes.
- Enhance flavour.
- Improve appearance.
- Improve palatability.
- Act as preservatives.

2.2.8 Eggs: Although hen's eggs are the most popular for consumption, eggs of turkeys, guinea fowls, ducks, and geese are also used. Eggs are used in various forms in cookery.

- As a leavening by foam formation to make the dish light, as in soufflés or meringues.
- For binding, as in egg croquettes.
- To improve flavour and colour, as in cakes.
- To add to the nutritive value.

- The protein of eggs, is unexcelled in quality, and is used as a standard against, which other food proteins are measured.
- Eggs make a substantial contribution of vitamins A and D and also contain a small amount of B complex vitamins and minerals.
- The essential fatty acids are more finely emulsified in eggs than in any other food thus assuring easy, complete digestibility and ready utilization.
- To decorate and garnish dishes.
- To enrich a mixture as in the case of rich cakes.
- As a thickening, as in custards and cooked salad dressings.
- For emulsification, as in mayonnaise sauce.
- For coating, as in fried foods.
- As the first semi-solid food taken by infants.
- As a nourishing and easily digestible food for invalids.
- As a quick cooking and nourishing dish for breakfast or main meals.

The action of heat on proteins accounts for the principal changes occurring when eggs are cooked. Both yolks and whites of eggs coagulate when heated. The temperature at which coagulation begins, the rate of coagulation and the firmness of the gel will depend upon:

- Intensity of heat.
- Length of heating period.
- The pressure of added material such as water, milk, sugar and salt.

Acid and salt speed up the process of coagulation, e.g.; to prevent disintegration of eggs when poaching, vinegar and salt are added.

Sugar increases the temperature at which coagulation takes place. When eggs are diluted by adding milk or water, the coagulation temperature is raised. If water is added rather than milk, coagulation results in a flocculent rather than a gelled structure.

An undiluted whole egg begins to coagulate at 57°-66° C (135°-150° F) and to gel at 70°-74° C (158°-165° F). The white of the egg alone starts coagulating at 58°-62° C (136°-144° F) and begins to gel at 62°-70° C (144° –158 F). In all the cases, the higher the cooking temperature, the more rapid the coagulation and the firmer the gel.

2.3 Conclusion

Raw materials are the cornerstones of culinary excellence. These sponsor nutritional value, flavor and color to the dishes. Every raw material has its own characteristics and is affected by heat, acid and other physical actions.

When the factors and what affects them are understood, the results can and should be excellent. A sign of inexperience is over seasoning or over thickening.

The aspiring culinarian should constantly work various combinations to develop a greater understanding of the interactions. Traditional boundaries have been relaxed in recent years, allowing the taking of a classical dish and adding a subtle twist. In this manner a culinarian develops a personal style. One of the greatest assets of culinary art and science is that, it is limited only by the imagination of the practitioner.

2.4 Self Assessment Questions

1. Discuss the brief role of salt in cooking?
2. Describe the role thickening agents in cookery?
3. Explain the importance of flavoring and seasonings in cookery?

2.5 References

1. Modern Cookery –Volume I by Thangam E Phillip
2. Theory of Cookery by Krishna Arora

LESSON 3

Preparation of Ingredients

3.0 Objectives

To discuss the techniques used in pre-preparation

To define and state the various kinds of textures

Contents

3.1 Introduction

Solid foods, which are to be mixed, have to be reduced into sizes that will allow them to combine readily. Many techniques are used for food preparation before cooking and they are done according to the requirements of the various dishes. This helps t improve appearance, texture, palatability and flavour and food combine readily. The techniques are divided into two:

- Sub-division and fractionalization.
- Combining and mixing in the preparation of food.

Mis-en-place: Literally means “everything in its place”, preparation prior to a task or service.

3.2 Sub- Division and Fractionalisation

- **Washing**: This is done to remove superficial dirt. Wash vegetables, meat and fish in cold water before any preparation is done. If cut and soaked for a long period or washed after cutting, there is a great loss of water-soluble vitamins and minerals. The more cut surfaces are exposed, the more nutrition is lost.
- **Peeling and Scraping**: Spoilt, soiled and inedible portions are removed. Skins of vegetables like potatoes, carrots etc, or of fruits are removed by either peeling or scraping. Care should be taken while peeling to remove as little of the fleshy part as possible. In some cases, steam, or caustics such as lye solution can strip the outer layer.
- **Paring**: Removing the surface layer in circular motion by pressure of a knife-edge all round the object as in paring an apple.

- **Cutting**: This is reducing to small parts by means of a knife or scissors. When the reduction is done by a chopping knife or a food chopper, it is known as chopping.
    1. ALLUMETE (Matchstick) - 1/16"x 1/16"x2"
    2. JULIENNE (Double match stick**)** – 1/8"x1/8"x2"
    3. BATONETTE (French fry) **–** ¼" x ¼"x 2"
    4. BRUNOISE (Square Allumete) - 1/16" x 1/16"x1/16"
    5. MACEDOINE (square julienne) – 1/8" x 1/8"x1/8".
    6. SMALL DICE (square baton) – ¼"x ¼"x ¼"
    7. MEDIUM DICE – ½" x ½" x ½"
    8. LARGE DICE – ¾" X ¾" X ¾"
    9. SLICE – to cut in to uniform cross cuts
    10. PAYSANNE – ½" diameter spheres or triangles
    11. PARISIENNE – round shaped
    12. OLIVETTE – olive shaped
    13. NOISETTE (TOULENNE OR TURNED) – small seven sided – barrel.
    14. CHATEAU – large barrel shape.
    15. CONCASSE – roughly Chopped.
    16. CHOP – cut into irregularly shaped pieces.
    17. MINCE- chop in to very fine pieces.
    18. EMINCER – cut in very thin slices.
    19. SHRED – cut into very thin strips.
- **Grating**: Reducing to fine particles by rubbing over a rough, sharp surface.
- **Grinding**: Reducing to small fragments by crushing in a mill, a grinding stone or an osterizer.
- **Mashing**: Method of breaking up soft with the help of a masher or fork.
- **Sieving**: Passing through a fine wire mesh t remove impurities, to break down to even portions, or to enclose air.
- **Milling**: Used for cereals, to remove husks etc.
- **Steeping**: Extracting coloring and flavouring by allowing ingredients to stand in water generally at a temperature just below boiling point
- **Centrifuging**: Promotion of separation through the application of a whirling force ex: separating cream from milk.

- **Evaporation**: Removal of excess moisture by heating.
- **Homogenization**: Sub-division of large drops into smaller ones by forcing them through a small opening under pressure, ex: fat in cream.
- **Skimming**: Removal of a floating layer by passing a utensil under it (ladle) as in skimming cream from milk.
- **Emulsification**: Blending two immiscible (insoluble) liquids together. Ex: oil and egg yolk in mayonnaise.

3.3 Combining and mixing in the preparation of food

Preparation of food also involves combining and mixing of different foods and food materials. Most important factor of this combining is to increase the palatability, provide good flavour and texture to the food. So, proper care must be taken while doing so. Various methods of combining and mixing foods are:

- **Beating**: Normally done to thin mixture of liquids to mix well and incorporate air. This item is used synonymously with whipping. Ex: beating of eggs.
- **Blending**: Mixing two or more ingredients thoroughly. Ex: blending milk into white roux for béchamel sauce.
- **Cutting In**: Usually the incorporation of fat in flour and other sifted dry ingredients with a knife, a method, which produces relatively coarse division of the fat and does not result in blending as in cutting the fat into a pastry mixture.
- **Creaming**: Softening of fat by friction with a wooden spoon, generally followed by the gradual incorporation of sugar as in cake making.
- **Folding**: Mixing mixtures by a careful lifting and dropping motion. The edge of the spoon is used and the mixture is lifted, turned completely and gently replaced. All the movements in this method, though deft, should be so gentle that the different ingredients are almost coaxed together.
- **Kneading**: Manipulating by alternating pressure with folding and stretching, ex: bread dough. A method of combination to the extent that it combines water and flour proteins to make gluten. Generally the food is pressed with the knuckles.
- **Marinating**: Coating the surface of food materials a marinade, which is usually is a mixture of oil and acid. Generally marinating is done before cooking to incorporate taste and flavour into the foodstuff. In some cases, marinating softens the hard tissues of the meat and indirectly reduces the time of cooking.
- **Rubbing-in**: Rubbing fat into flour using the tips of the fingers and thumb and lifting the hand out of the basin as in the case of short crust pastry. Rub until the mixture looks like breadcrumbs.
- **Rolling In**: Rolling butter or fat in a soft dough, ex: puff pastry.
- **Pressing**: This is done to shape foods like cutlets and sometimes as a method of sub division to separate liquids from solids by weights or mechanical pressure, as in the case of panir.

- **Stirring**: Mixing foods with a suitable tool such as a spoon by a circular motion in contact with the pan. Ex: stirring white sauce, while cooking.
- **Whipping**: Rapid beating using an eggbeater or a mechanical beater to incorporate air and so increasing the volume, for example whipping of egg whites.
- **Whisking**: It is done when an item needs a lot of air, items if needed to be mixed together so that they do not separate.

3.4 Texture

The texture, as related to food is not an entity I itself, but rather the accumulated effect of several characteristics or qualities to create an individuality such as;

v Appearance

v Feel to touch

v Softness

v Mouth feel

Texture: It is the term used to describe the characteristics of a finished food product. Variety includes some hard and soft food in a meal, so that the amount of chewing required is varied. This is one of the points that is considered while planning a menu. The menu includes dishes that have different textures as soft, crisp, hard, smooth, etc. all the above mentioned factors contribute to the concept of texture.

Appearance: it is the first factor in the appreciation of food. The size, shape and distribution of cells (holes) are of prime importance. Ideally the holes should be comparatively small, slightly oval or elongated and evenly distributed. Large cells (holes) produce coarseness to the eye, as in cakes, bread etc.

Feel to touch: the perceptiveness to touch should be exact as it is desired to be - a sponge cake should be light and spongy.

Softness: It is the characteristic of texture and the product should possess the resiliency (springiness) to gradually return to its normal shape – idlis, khaman dhokla, bread etc.

Mouth Feel: texture involves feels or bite tenderness – dry, soft, wet, hard, firmness, crumbliness and short.

Observation, experience, preparing foods, by adding ingredients and incorporating and applying the right principles (combining, mixing, fractionation, etc.) has a definite bearing in the result.

Various Textures:

- **Firm and close**: raising agents added raise the food, the volume is increased, the holes are small and many. The products are crisp and not spongy, e.g. biscuits, tartlets, etc.
- **Short and crumbly**: The product is short and it just melts in the mouth, when eaten. The right quantity of fat added gets this effect. More fat is added, as it prevents the texture from becoming hard and short. It is very similar to firm and close texture, e.g. shortbread, nankhatai, biscuits, short crust pastry etc.

- **Light and even**: There are plenty of holes more or less the same size. It is less short than pastry and less spongy than a sponge cake. The product is firm to touch, e.g. Madeira, queen cakes, etc.
- **Spongy**: The holes (air cells) are small and evenly distributed, as air has been included. It is soft and elastic to touch as in idlis, Khaman dhokla, Swiss rolls etc.
- **Flaky**: the pro\ducts have this crisp flakes and they are formed by air pockets. The crispness is due to the method of rubbing fat with the flour. In order to get a good flaky texture, the right temperature, the right amount of ingredients, proper mixing and correct temperature is essential, e.g. Vol-au-Vent, patties, bouchees, parathas, etc.
- **Smooth**: when a dry ingredient is added to a liquid and the blending results in a smooth texture, e.g. sauces, batters, gravies, phirnees.

Incorrect textures spoil a dish and should be avoided. Some of the incorrect textures are;

- Coarse and open texture: This may be due to insufficient creaming of the fat and sugar, or careless mixing of flour, when added. Too much of raising agents also give a coarse and open texture.
- Hard texture: The air enclosed has been driven off, may be due to the addition of more liquid than required, or has not been mixed properly. Low temperature of the oven also spoils the texture.
- Soggy texture: this occurs where there is the presence of too much moisture, as it combines the ingredients and the starch gets overcooked and tends to stick, e.g. while preparing rice.
- Lumpy texture: this happens when the liquid and solid is not mixed properly at the same temperature or even if they are at the same temperature. Once the lumps are cooked, they are difficult to remove. This texture may occur in sauces, gnocchi, Suji halwas, etc.

3.5 Conclusion

Not to surprise to know that, a large part of the chef's working day is spent doing mise-en-place. Pre-preparation / mise-en-place is very essential to finish the products without much loss of quality. While even on the simplest level, pre-preparation is necessary, in commercial kitchens, where as many items are to be cooked, the situation is more complex. Hence it requires a lot of attention and carefulness on this part

The goal of the pre-preparation is to do as much in advance as possible. So that all energy can be used during the final preparation, which is done just before serving, with the utmost attention to quality and freshness.

Many techniques, which are in common use are designed for the convenience of the culinarians at the expense of quality, but remember "QUALITY ALWAYS SHOULD TAKE HIGHEST PRIORITY".

3.6 Self Assessment Questions

1. What is mise-en-place? Discuss it in detail?
2. What are the ten basic common cuts and their measurement?
3. Define texture. Explain the characteristics of different textures?

3.7 References

1. Theory of Cookery by Krsihna Arora
2. Food Science 3rd edition by B Srilakshmi

LESSON 4

Methods of Cooking

4.0 Objectives

To introduce and discuss in detail about various methods of cooking

To discuss the concept of heat transfer and its relation to food preparation

To discuss the effect of heat on foods

Contents

4.1 Introduction

Cooking helps to preserve colour, get a variety of texture, enhance flavours and make the nutrients easily available, though a few of the nutrients, which are water soluble are lost or oxidized.

There is a range of cooking methods; different cooking methods are suited to different kinds of foods. They are many factors to consider when choosing cooking methods for meats, fish, game, poultry and vegetables, such as flavor and appearance impose by browning, the flavor imparting by the fats and the firmness and delicacy of the product.

4.2 Methods of Heat Transfer

Heat can be transferred by three methods- Conduction, Convection and Radiation. Two or three of these methods may be combined.

- **Conduction**: It is the passage of heat through a solid or one solid to another provided they are in contact, for example, a pot on a hot plate.
- **Convection**: It involves the transfer of heat in liquids and gases. In heating liquids or gases, convection currents are produced, which distribute heat. For example, when water is heated in a saucepan, the water at the bottom is heated first, it rises to the top as it is lighter and the heavier cold water takes its place at the bottom of the pan.

- **Radiation**: It is the passage of heat in straight rays from a hot object. Any object in the part of the rays becomes hot. For example, gas and electric grills.

Sources of Heat

4.3 Basic methods of cooking

Cooking methods are classified as 'Moist heat'. 'Dry heat' and 'Other heat' methods

- **Moist heat**: Moist heat methods are these in which the heat is conducted to the food by water (including stocks, sauces etc) or by steam.
- **Dry heat**: Dry heat methods are those in which the heat is conducted with moisture i.e., by hot air, hot metal etc.
- **Other methods**: It usually include cooking using by Microwave and solar energy

The various methods of cooking include:

- Boiling
- Poaching
- Steaming
- Stewing
- Braising
- Roasting
- Grilling
- Baking
- Frying
- Griddling or Broiling

Moist Heat Methods

4.3.1 Boiling: Boiling is cooking by immersing the food in a pan of liquid, which must be kept boiling all the time. Boiling is restricted for meat and poultry for the first few minutes in order to seal the pores, to retain natural juices and then gentle boiling must take place, which is known as simmering at 82°-99° C (180°-210°F). Boiling temperature is 100° C (212° F). Vegetables are boiled at 100° C. Blanching is used when food needs to be pre-cooked or partly cooked.

Purpose

The purpose of the boiling is to cook food so that it is:

- Pleasant to eat within agreeable flavor
- Of a suitable texture, tender or slightly firm according to the food
- Easy to digest and safe to eat

Basic Rules

- The food items should be completely immersed throughout the process; in case of excess evaporation, the liquid must be replenished.
- The flavour of meat and poultry is enhanced by the addition of herbs and vegetables to the liquid.
- Scum that arises during the boiling must be removed or it will discolour and spoil the taste.
- The liquid in which the food is boiled is called as “pot liquor”. It contains nourishment and flavour and so it must not be discarded but used for making sauces and gravies.
- While boiling green vegetables, boiling should be very fast as it preserves the green colour and prevents the moss of vitamins and mineral contents. The pan should never be covered while boiling green vegetables.
- Root vegetables, except for new potatoes, must be placed in cold water to boil. This helps to improve their flavour by reducing the acrid taste of the root vegetables.
- Stocks, sauces and soups should be simmered gently. This will avoid them from becoming cloudy as it prevents the scum from getting mixed with the pot liquor.
- Fish should never be boiled but poached, as it prevents it from breaking up. Fish should be wrapped in a cloth and then poached.

Advantages of boiling:

- Older, tougher, cheaper joints of meats and poultry can be made palatable and digestible
- It is appropriate for large scale cookery and is economic on fuel
- Nutritious, well flavored stock can be produced
- Labor saving, as boiling needs little attention
- Helps to tenderize the fibrous texture (meat) extract starch (vegetable soups) and flavor from certain foods (stocks)
- It is the simplest method. It does not require special skill and equipment
- Uniform cooking can be done
- Protein gets denatured, starch gets gelatinized and collagen gets hydrolyzed.
- Soluble starches can be removed and rice grains are separated.

Disadvantages:

- If excess water is used in cooking and the water is discarded 30%-70% water soluble vitamins like Vitamin C may be lost.
- Water soluble pigments like betanin from beetroot may be lost.
- Boiling may take time and fuel may get wasted
- Boiled foods are not considered as tasty foods because flavor compounds are leached into the water.

- Over boiling of food may make the food mushy.

Time and temperature control

Temperature must be controlled so that the liquid brought to the boil, or re-boiled, then adjusted in order that gentle boiling takes place until the food is cooked to th required degree. Stocks, soups and sauces must only simmer, pasta cooked slightly firm, meat and poultry well cooked and tender vegetables should not be over cooked.

All the approximate cooking times are given for most foods, the age, quality and size of various foods will nevertheless effect the cooking time required.

4.3.2 Blanching: Place the food item in cold water and bring to boil, remove and refresh. It seals the juices and flavour.

4.3.3 Poaching: Poaching is cooking food gently in water, which is just below boiling point (around 93°-95° C). The liquid should be almost near the boiling point without any noticeable movement of the liquid.

Purpose:

- The purpose of poaching is to cook food so that it is:
- Easy to digest
- As suitable tender texture
- Safe and peasant to eat because, where appropriate, an agreeable sauce is made with the cooking liquid.

Basic Rules:

- Food should be completely immersed in the liquid and left in throughout the cooking process.
- As soon as the liquid with the food item begins to boil, lower the temperature to allow poaching.
- Whole fish must be placed into cold liquor to poach. Cuts of fish must be placed into boiling liquor; temperature lowered and allowed to poach.
- The liquid for poaching eggs should be simmering and fresh eggs must be added one at a time, which will help to get the round shape. Adding vinegar and salt will further help in quicker coagulation and prevents disintegration. It is always important that fresh eggs must be used for poaching.

Advantages:

- Very quick method of cooking
- Easily digestible since no fat is used

Disadvantages:

- It is bland in taste
- Water soluble nutrients may be leached into the water.

Temperature and time control:

- Temperature must be controlled so that the cooking liquid does not fall below or exceed the correct degree required
- Shallow poaching is just below simmering point (and may be carried out in an oven); deep poaching is just below gentle simmering.
- Time is important so that the food is neither undercooked, therefore unpalatable nor over cooked, when it will break up and also loose nutritive values.
- The various types and qualities of food will affect both time and temperature needed to achieve successful poaching.

4.3.4 Steaming: Steaming is cooking by moist heat, i.e., steam-direct or indirect. Indirect steaming is done when the food is placed in a closed pan, which is surrounded by plenty of steam from fast boiling water or in a steamer. Direst steaming is by placing the article in a perforated container or on a covered plate over a saucepan of water.

Purpose: The purpose of steaming food is to cook it, so that it is:

- Easy to digest
- Of an edible texture, pleasant and safe to eat
- As nutritious as possible (steaming minimizes nutritive loss)

Basic Rules:

- Only small suitable food items should be steamed, as it is cooked slowly. Green vegetables are not suitable; for steaming as they lose their colour.
- Puddings in basins must be covered with greaseproof paper to prevent condensed steam from making the pudding wet.
- Root vegetables including potatoes must be placed on perforated tray that will allow condensed steam to circulate, and cook them.
- It is a good method for invalids, as the steamed foods are easily digested. Nourishment and flavour are retained in the food and usually the food cannot be easily overcooked.

Advantages:

- Retention of goodness (nutritional value)
- Makes some food lighter and easy to digest (suitable for invalids)
- Low-pressure steaming reduces risk of over cooking protein
- High-pressure steaming enables food to be cooked or re-heated quickly, because steam is forced thorough the foods, thus cooking it rapidly.
- Labor saving and suitable for large scale cookery
- Hi-speed steamers used for batch cooking enable that frequent cooking of small quantities of vegetables throughout the service, keeping vegetables freshly cooked., retaini9ng color, flavor and nutritive value

- With steamed fish, the natural juices can be retained by serving with fish or in making the accompanying sauce.
- Steaming is economical on fuel as a low heat is needed and a multi-tired steamer can be used.

Disadvantages:

- Special equipments are required.
- Many foods can not be prepared by this method, for example rice.

Time and temperature control:

- For high-pressure steam foods should be placed in the steamers when the pressure gauge indicates the required degrees of pressure. This will ensure that the necessary cooking temperature has been reached
- Cooking times will vary according to the equipment used in the type, size and quality of food to be used. Manufacturers' instructions are an essential guide to successful steaming.

4.3.5 Stewing: Stewing is gentle simmering in a small quantity of water, stock or sauce, until the cut food items are tender. Both liquid and food are served together. It is a time-consuming method of cooking, but the advantage is that the coarser, older and cheaper types of poultry and meat are used, as they are unsuitable for grilling and roasting. Normally, cheaper cuts of meat and certain fish are prepared by this method, as it renders it renders it tender and palatable. Stewing is done in covered saucepans or casseroles on top of the cooker, or I the oven- but always at a low temperature.

Purpose:

Because stewing is both economical and nutritional, cheaper cuts o meat and poultry, which would be unsuitable for roasting and grilling, can be made tender and palatable. Stewing also produces an acceptable flavor, texture and eating quality.

Basic Rules:

- While stewing, the liquid covers the food items.
- It is a slow process in the liquid or sauce and the long process of cooking will give a concentrated flavour to both the food and the sauce.
- Items suitable for stewing are those, which are of a tough nature.
- The liquid should not reach too high a temperature, as the slow process of cooking by gentle heat.

Advantages:

- The meat juices that escape from the meat during cooking are retained in the liquid, which part of the stew.
- Correct slow cooking results in very little evaporation.
- Nutrients are conserved
- Tough goods are tenderized

- It is economical in labor because foods can be cooked in bulk

Disadvantages:

- This process is time consuming

Temperature and time control:

- Temperature control is essential to the slow cooking required for the efficient stewing; therefore the liquid must barely simmer.
- The tight-fitting lid is used to retain steam, which helps maintain temperature and reduce the evaporation.
- Time will according to the quality of the food is used.
- The ideal cooking temperature for stewing on top of the stove is approximately 82°C (180°F)

4.3.6 Braising: This is a combined method of roasting and stewing. Braising is done in a tight fitting lid or casserole preventing evaporation. This helps the food to retain its own juices together with the flavourings added like bacon, ham, vegetables and herbs. As it is a long method of cooking, it is good for cooking matured meat and poultry and less tender cuts of meat.

Method: The meat is first browned in its own fat or small amount of hot fat. This seals the pores and thus the juices are retained. It is then placed on a bed of root vegetables, stock or sauce are added till two thirds of the meat. To this flavourings and seasonings are also added. Then it is covered with a lid and is allowed to cook gently on the stove or in the oven. When nearly done, the lid is removed and the joint is frequently basted to glaze it. It is usually done in an oven to get an even colouring.

Purpose: The purpose of braising is

- To give variety to the menu in the diet
- To make food tender, digestible, palatable and safe to eat
- To produce and enhance flavor, texture and eating quality

Basic rules:

- Braising pan (with handles on either side and tight fitting lid) should be in keeping with the size of the food item to be braised. This is to ensure even cooking to avoid hot spots and cold spots.
- Fresh vegetables and herbs, with aroma should be used as a bed for the joint to be braised.
- Food items that is meat, poultry and game should be evenly colored while frying before being braised.
- Braising should be done slowly so as to enable the interchange of flavor between the item and the liquid.
- An appropriate liquid should half-cover the food item.
- Items of meat, poultry and game suitable for braising are those of a tough nature, rather than those of a tender nature.
- Braise vegetables are better, if served with a good sauce made separately. Braising liquor is strong and similar in taste to the vegetables.

Advantages:

- Tougher, less expensive meats and poultry can be used.
- Maximum flavor and nutritional value are retained
- Variety of presentation and flavor is given to the menu

Time and temperature control:

- Slow cooking is essential for efficient braising; the liquid must barely simmer.
- To reduce and maintain temperature use a tight-fitting lid.
- Time needed for braising will vary according to the quality of food
- Ideal oven temperature for braising is 160°C (gas mark 3320°F)

Dry Heat Methods:

4.3.7 Roasting: Roasting is cooking in dry heat with the aid of fat or oil in an oven or on a spit. Radiant heat is the means of cooking when using th spit; oven roasting is a combination of convection and radiation.

Purpose: The purpose of roasting is to cook food so that it is tender, easy to digest, safe to eat and palatable. It also gives variety to the menu and the diet.

The traditional methods of roasting practiced at present are:

a) Pot Roasting: Cooking is done in a covered pot or pan. Only good quality meats like small joints and birds are used. It is placed in a thick-bottomed pot and stewers are placed at the bottom to prevent the meat from sticking to the pan. Fat should cover the bottom of the pan. The joint should touch the fat, cover the pot with a well-fitting lid and cook on slow fire. The joint should be basted occasionally to ensure even cooking.

b) Oven-Roasting: Cooking in an oven with the aid of fat and first class meat; poultry, and certain vegetables are used. It is put in hot fat and all sides are browned to seal the juices. Salt can be used. Baste them meat often. The average time for cooking is 15 minutes per lb (455 gm). After 15 minutes, aromatic vegetables should be added for flavouring during cooking.

Note: Roasting tray should be placed on the fire and the juices allowed to caramelize and the brown stock is added and brought to boil. This brown gravy is called “Jus roti” and the actual process is called deglazing.

c) Spit Roasting: It is the original form of roasting. It is cooking by direct heat, basted with fat. A spit is constantly revolved to ensure even colouring and cooking. First class quality of small pieces of meat are used and the meat pieces should be succulent (juicy).

d) Poeling: It is similar to pot roasting; the difference is that it is cooked in butter. Special peelings are known as “encasserole” and “encocotte”.

- **Encasserole**: Food item is poeled, only in butter without the addition of vegetables.

- **Encocotte**: The procedure is the same as encasserole, except that the food item is garnished with vegetables such as mushrooms, small onions, carrots etc. which are turned and cooked in butter before being used.

Basic Rules:

- Items of meat, poultry and game for roasting must be tender and of top quality.
- Food items must be raised of the bottom of the roasting tray to prevent the frying of the lower part.
- The juices from the process of roasting meat, poultry and game must be used to take the accompanying gravy.
- To facilitate the slicing of roasts, and other cuts of cooked meat, piece should be allowed to remain at room temperature, after it has been removed from the heat for fifteen to thirty minutes. This sets the juices, allowing them to soak back into the muscle and is easier to slice because, the meat becomes firm.
- The thicker the meat, the lower should be the cooking temperature.
- Meat is considered rare when it reaches the temperature of 60°C (140°F);this is the internal temperature of cooked spots. For well done meat the internal temperature is 82°-85°C (180°-185°f)

Advantages:

- Good quality meat and poultry is tender and succulent when roasted.
- Meat juices issuing from the joint are used for gravy and enhance the flavor.
- Both energy and oven temperatures can be controlled.
- Ovens with transparent doors enable cooking to be observed.
- An access, adjustment and removal item is straightforward.

Time and temperature control:

- Ovens must be pre-heated
- Oven temperature and shelf-setting in recipes must be followed.
- Shape, size, type, bone proportion and quality of food will affect the cooking time.
- Meat thermometers or probes can be inserted to determine th exact temperature in the center of joint.

4.3.8 Grilling: The food is placed on grill bars, and subjected to the action of radiated heat, which could be from above or below. In an authentic grill the heat is located below the grill bars and if the source of heat is above the grill bars, the grilling equipment is called salamander.

Purpose: The purpose of grilling is;

- To make foods digestible, palatable and safe to eat
- To utilize the speed o0f cooking process, to produce the distinctive flavor, color, texture and eating quality.

- To bring variety to the menu and to introduce into the diet simple, uncomplicated dishes.

Methods of grilling:

- Over heat (charcoal, barbeques, gas or electric heated grills, griddles)
- Under heat (gas or electric salamanders)
- Between heat (electrically heated grill bars or plates)

Some French Grilling Terms:

- Au Bleu - rare, very underdone
- Saignant - underdone
- A point - just done
- Bien cuit - well cooked.

Basic rules:

- Items for grilling must be small in size, flattened and of top quality
- The items should be oiled and seasoned and fish must be floured, oiled and seasoned
- Heat should be intense to enable sealing at once and coloring; a brown crust should form, which seals the juices of the food.
- Grilled bars should be cleaned and oiled

Advantages:

- Speed of grilling enables food to be quickly cooked to order.
- Charring foods gives a distinctive appearance and improves flavor
- Control of cooking is aided because food is visible whilst being grilled
- Variety is given to the menu and diet.
- Grills may be situated in view of the customer so that it can attract the customer's eye.

4.3.9 Broiling: Cooking by direct heat and is used synonymously with grilling. It could be done by source of heat above or below. It is dry cooking and can be done on a grid (iron bars) or pan broiled, where the food is cooked and uncovered. The pan or grill is oiled slightly to prevent sticking, excess fat removed.

Stirred eggs (Oeuf sur la plat) is a good example of broiling.

4.3.10 Baking: Cooking of food by dry heat in an oven. The degree of dryness of heat may be modified by the amount of steam produced from the item baked. For example, Bread Rolls, Cakes, Pastries, Puddings. Baked yeast goods should have a hot oven at 220° C.

Purpose:

- To make food digestible, palatable and safe to eat
- To create eye appeal through color and texture and produce an enijoyable eating quality

- To lend variety to the menu

General Rules:

- Always pre-heat ovens so that the required cooking temperature is immediately applied to the product, otherwise, the product will be spoiled
- Accuracy is essential in weighing, measuring and controlling temperature
- Trays and moulds must be correctly prepared
- Minimize the opening of oven doors as draughts may affect the quality of product and the oven temperature is reduced.
- Utilize oven space efficiently.
- Avoid jarring of products (fruit cake, sponges, soufflés) before and during booking as the quality may be affected.

Advantages:

- A wide variety of sweet and savory foods can be produced.
- Bakery products yield appetizing goods with eye appeal and mouth-watering aromas.
- Bulk-cooking can be achieved with uniformity of color and degree of cooking.
- Baking ovens have efficient manual or automatic temperature controlling systems.
- There is a straight forward access for loading and removal of items.
- Flavor and texture are improved
- A variety of dishes can be made.

Disadvantages:

- Special equipments and skills are required.

Time and temperature control:

- Ovens must always be heated to the required temperature before the food is added.
- In general purpose ovens, shelves must be placed according to the food being cooked, because the hotter part of the oven is at the top with the convection ovens the heat is evenly distributed.
- Accurate timing and temperature control are essential to baking. The required oven temperature must be reached before each additional batch of goods is placed in the oven. This is known as recovery time.

4.3.11 Frying: This is the method of cooking where the food to be cooked is brought in contact with the hot fat. Fried food is treated as delicacy, but is rather complicated, while digesting. However fried food in right quantity does not affect a normal person. Frying can be done by two ways. Those are shallow-fat frying and deep-fat frying.

4.3.11.1 Shallow Frying: shallow frying is the cooking of food in a small quantity of pre-heated fat or oil in a shallow pan or on a flat surface.

Purpose: The purpose of shallow frying is

- To give variety to the menu and the diet by making food palatable, digestion and safe to heat
- To brown food, giving it a different color and an interesting and attractive flavor

Methods: There are four methods pf frying using a shallow amount of fat or oil.

- Shallow fry
- Sauté
- Griddle
- Stir fry

Shallow fry: food is cooked in small amount of fat or oil in a frying pan or a sauté pan. The presentation side of the food should be fried first, as this die will have the better appearance because the fat is clean, then turned so that both sides are cooked and colored. This applies to small cuts of fish, meat and poultry and also small whole fish, eggs, pancakes and certain vegetables are cooked by this method.

Sauté: tender cuts of meat and poultry are cooked in a sauté or frying pan. After the food is cooked on the both sides it is removed from the pan, the fat is discarder and the pan deglazed with stock or wine. This then forms an important of the finished sauce.

Sauté is also used when cooking, for example potatoes, onions or kidneys when they are cut into slices or pieces and tossed in hot shallow fat or oil in a frying pan until golden brown and cooked.

Griddle: foods can be cooked on a griddle (a solid metal plate). Hamburgers, sausages or sliced onions are placed on a lightly oiled pre-heated griddle and turned frequently during cooking. Pancakes may be cooked this way, but are turned only once.

Stir fry: vegetables, strips of fish, meat and poultry can be fast fried in a wok or frying pan in a little fat or oil.

Advantages:

- Shallow frying is a quick method of cooking prime cuts of meat and poultry as suitable fats or oils can be raised to a high-temperature with out burning. As the food is in direct contact with the fat it cooks rapidly.
- Taste is improved along with texture
- Increases the calorific value

Time and temperature control:

This is particularly important as all shallow-fried foods should have an appetizing golden brown color on both the sides. This can only be achieved by careful control temperature, which should be initially hot; the heat is then reduced and the food turned when required.

4.3.11.2 Deep fat frying: This is the cooking of food in pre-heated deep oil or clarified fat. It is the quick method of frying and a popular method for Indian cuisine. The holding temperature range for deep fryer is 90°-110°C.

As the food is immersed in the hot fat, It is essential that the fat is of a good quality having a high smoking point. The frying pan should have a sufficient depth. The size and shape of the food to fried should be uniform. Fried foods have a good appearance. Some of the fried foods are; rissoles, cromesquies, chicken and mutton cutlets, fish cakes, potatoes, vegetables, fritters, beignets, croquettes, pakodas etc.

Purpose:

- To cook appetizing foods of various kinds thus giving to the diet in the menu
- To produce food with an appetizing golden brown color, crisp, palatable and safe to eat.

Basic Rules:

- The fat must be hot enough to seal the outside of th items being fried. This prevents the food from absorbing any fat and to prevent any loss of flavor.
- Prevents the escape of juices; all items except potatoes must be seasoned and coated with either batter, flour, egg or breadcrumbs before being fried.
- Too may items should not be put at a same time as it will reduce the temperature to the point where the food will absorb fat, loose its juices, become soggy and heavy or break-up.
- The fried items should have a uniform golden color.
- Drain well on paper and serve at once on doily.
- The fat used for frying should be strained and stored in a cool place, if possible a frying basket should be used to give uniform coloring and heating to the items fried.
- If fat that has been used for cooking, is used again, it should be replenished with fresh fat for re-using in the ratio of 1:2.
- Wet food items example potatoes should be well-dried before being-fried.

Advantages:

- Blanching or partial cooking, enables certain foods to be held for cooking later, which helps during busy service and saves time.
- Coating foods enables a wide variety to be cooked by this method.
- Foods can be cooked quickly and easily handled for service.
- Coated foods are quickly sealed, thus preventing the enclosed food becoming greasy.

Disadvantages:

- Sometimes the food may become oily or soggy with too much absorption of oil.
- More attention is required while cooking and care should be taken to avoid accidents.
- The food becomes very expensive.
- The fried food takes long time to digest.
- Repeated use of heated oils may produce harmful substances and reduce the smoking point.

Temperature and time control:

With deep fat frying it is essential for fat temperatures to be maintained at the correct degree. When quantities of food being continuously fried, after the removal one batch the temperature of the fat must be allowed to recover before the next batch is cooked. If this is not done the food will be pale and insipid in appearance and soggy to eat.

Timing is important; if thicker pieces of food are being cooked the temperature must be lowered to allow for sufficient cooking time otherwise the food will be over colored and under cooked. The reverse is also true; smaller pieces of food the hotter the frying temperature the shorter the cooking time.

4.3.12 Microwave cooking: This is a method of cooking and reheating food using electro-magnetic waves in a microwave oven powered by electricity. The microwaves are similar to those that carry television signals from the transmitter to that the receiver but are at higher frequency. The microwaves activate the water molecules or particles of food and agitate them, causing heat by friction, which cooks or reheats the food.

Purpose:

- Raw or prepared or pre-cooked foods are cooked quickly and made palatable and digestible.
- Foods are safer to eat, particularly reheated foods, because the total food is heated at the same time.

General Rules:

- Correct selection of cooking and time controls according to the manufacturers' instructions is essential.
- Certain foods must be removed when underdone to finish cooking, so standing time is important; during this time for example, fish turns from opaque to flaky, scrambled eggs turn creamy.
- Tender, crisp vegetables do not need to stand.
- Baked potatoes and whole unpeeled apples must have the skin pierced in order to release pressure and prevent them bursting.
- Eggs must not be cooked in their shells, or they will burst.
- Cover foods when possible to reduce condensation and spluttering.
- The lower the starting temperature of the food the longer it will take to heat.
- The denser the food, the longer it will take to heat.
- The thicker or deeper the food, the more awkward it is to heat, i.e. there is an ideal microwave depth of penetration for each food item.
- The weight or quantity of items influences the overall eating times.
- A cover is an important aid to faster heating, more moisture retention and less cleaning of afterwards.

Advantages:

- A saving of between 50% -70% over conventional cooking times on certain foods
- A quick way to cook and reheat foods
- A fast method of defrosting foods
- Economical on

  Electricity-less energy required

  Labor – less washing up as foods can be cooked in serving dishes
- Food is cooked in its own juices so flavor and goodness are retained
- Minimizes food shrinkage and drying out

Disadvantages:

- Not suitable for all foods
- Limited oven space restricts use to small quantities
- Many microwave ovens do not brown food, although browning elements are available with certain models
- Not all containers are suitable for use
- Microwaves can only penetrate 5cm into food from all sides.

4.3.13 Solar cooking: Solar cooker works on solar energy. Solar cooker can directly utilize solar energy or can use deflected solar energy from a large concentration rays surface.

Solar cooker consists of a well-insulated box, the inside of which is painted dull black and is covered by one or more transparent covers. The purpose these covers is to trap heat inside the solar cooker. These covers allow radiation from the sun to come inside but do not allow the heat from the hot black absorbing plate to come out of the box. Because of this the temperature of the blackened plate inside the box increases and can heat up the space inside the temperature up to 140°C, which is adequate for cooking.

The second type of solar cooker uses a lens or a reflector suitably designed to concentrate the solar radiation over a smaller area. This cooker is able to provide higher temperatures on its absorbing surface, when suitably designed, but is usually more expensive than the box cookers.

Advantages:

- It does not require any cooking gas or kerosene or any conventional fuel.
- Simultaneously more than one recipe can be prepared.
- Keeps the environment clean
- Less expensive compared to the conventional source of energy
- Conserves the conventional source of energy
- Constant attention is not required
- Cost of the cooker and maintenance cost is low
- No smoke and no soot, hence cleaning the vessels is easy.

Disadvantages:

- Depends on sun and it may not be possible to use on cloudy and rainy days
- Takes longer time and planning is required
- Special vessels need to be used

4.4 Effects of heat on food

Foods are composed of proteins, fats and carbohydrates and water, plus small amounts of other compounds such as minerals (including salt), vitamins, pigments (coloring agents), and flavor elements. It is important to understand how these components react when heated or mixed with other foods. You will then be better equipped to correct cooking faults, when they occur and to anticipate the efforts of changing cooking methods, cooking temperatures or ingredient proportions.

In other words, when you know why foods behave as they do, you can understand how to get them to behave as you want them to.

4.4.1 Effect of heat on Carbohydrates: Generally, starch swells up and becomes softer. Starch is enclosed with granules. They cannot be easily digested, but on heating they swell up and burst and release the starch.

- Cellulose is softened by the application of moist heat.
- Sugar, when heated in water dissolves, then colors, upon further heating, turns brown and becomes a caramel. Sugar is changed into invert sugar.

Small thread	-	102° C	-	216° F
Large thread	-	103° C	-	218° F
Pearl	-	106° C	-	222° F
Soft ball	-	114°-116° C	-	237° F .
Ball	-	119° C	-	245° F
Hard ball	-	120°-121° C	-	247° F
Small crack	-	140° C	-	284° F
Soft crack	-	143° C	-	290° F
Hard crack	-	156°-160° C	-	312° F
Caramel	-	163°-177° C	-	325° – 350° F

4.4.2 Action of heat on protein: Protein coagulates or sets when heated. Ex: white of an egg. This coagulation helps in keeping nourishment within the food itself. High temperatures hardens the protein, denatures and shrinks and the food becomes indigestible.

4.4.3 Action of heat on fats: Fat melts when it comes in contact with heat. If heated at high temperatures for a long time, it undergoes partial decomposition. The temperature at within decomposition sets in when an amount of fat is heated is known as its smoke point. The specific temperature at which this takes place varies with different fats and is lowered by repeated heating. With repeated use, fat deteriorates, because of excessive temperature, moisture, air and the

presence of carbonized crumbs and small pieces of food, to a point where it will just bubble in the pan, too weak to perform the function of frying. Abnormal absorption caused by frying for too long at low temperature also contributes to the breakdown. Fat also begins to thicken and become gummy. This condition is known as polymerization, and has reached this stage no longer fit for use.

4.4.4 Effect of heat on minerals: No appreciable loss of minerals due to cooking, some minerals are made more readily available by cooking.

4.4.5 Effect of heat on vitamins:

Vitamin A	Not destroyed by ordinary cooking methods.
Vitamin B	May be destroyed if cooked at high temperatures.
Vitamin C	Vitamin C is easily soluble in water and is easily dissolved during cleaning and cooking process; there fore vegetables containing Vitamin C should not be soaked in water and cooking liquor should be made use of.
Vitamin D	Not destroyed by ordinary cooking methods.

4.5 Conclusion

No written recipe can be hundred percent accurate. No matter how carefully a recipe is written, the judgement of the culinarian is still the most important factor in making a preparation turn out well. A culinarians' judgement is based on experience, and an understand of the control of heat transfer. When this control is exercised with care and finesse, the result can be marvelous and simple dishes can be masterpieces.

4.6 Self Assessment Questions

1. What are the various methods of cooking? Explain any two in detail?
2. Explain the methods of cooking – Boiling, Poaching, Braisisng and Roasting?
3. Write a brief note on Microwave and Solar cooking?
4. List and discuss three ways in which foods are heated?
5. Discuss the effect of heat on various food stuffs?

4.7 References

1. Theory of Catering by Ronald Kinton and Victor Ceserani
2. Theory of Cookery by Krsihna Arora
3. The Art and Science of Culinary Preparation by Jerald W Chesser
4. Food Science 3rd edition by B Srilakshmi

LESSON 5

Principles of Food Storage

5.0 Objectives

This lesson creates an awareness in the students mind about the different temperature zones used to store various food materials used in kitchen. It also gives an idea to learner regarding the shelf life of the different ingredients.

Contents

5.1 Introduction

The fundamental principle in the storage of food is to keep it clean, cool and covered. When food is available more than the present use it is stored for future consumption.

Storing food not only means keeping it free from visible dirt, but also keeping it in such a way as to prevent the multiplication of germs. High-temperature kills the micro-organisms, while freezing keeps them in suspended animation. Hence food should be kept cool and dry.

5.2 Lay out of Storeroom

The storeroom should be dry, well lit, ventilated, vermin proof and clean. Cupboards and shelves should be simple design without dust-collecting ornamentation, unnecessary ledges or panels. Doors should be so designed as to enable the whole shelf to be clearly visible and accessible when doors are opened. Windows and doors should have fly-proof mesh.

Shelves must be constructed for specific purposes. They should be so fixed that they could be easily taken down and re-erected to facilitate regular cleaning. They should be narrow enough to enable all the goods to be accessible.

As for as possible avoid having shelves above windows. The bottom shelf should be at least 75cm above the floor so that it will be easy for the cleaning. . Special covering covered with marble, hard stone or tiles should be set a side for such materials as fat.

Basic Rules:

- No food should be kept in the kitchen or ladder, part from what is required during the day.

- No food stuff, even when in bins, boxes or cartons should be stored directly on the floor.
- Segregate the food to be used promptly from that is to be held for sometime. Use food in the order on priority rule – “First In First Out)
- Stocks should be inspected once a week. A stock list should be made to tick off inspection dates and to indicate conditions.

5.3 Storage Zones

Basically foods are divided into two categories i.e. Perishables and non-perishables and stored at three temperature zones;

- Pantry –shelf storage
- Refrigerator storage
- Freezer storage

5.3.1 Pantry –shelf storage: Generally staples, canned, dried food items, herbs and spices are stored in this kind of storeroom.

Temperature: Food is stored at room temperature and in well ventilated cabinets. It should not be stored over a cooking range or near refrigerator exhausts. Use cool areas for storing large amount of potatoes, onions etc., and for log-term storage of canned foods.

Time: Though most staples and canned foods are kept indefinitely, buy no more than you expect to use. While foods can be safe beyond safe beyond the recommended storage times, flavors will reduce and textures will wilt. Date the food stuffs, you are keeping in stores. Check cabinets every six months and push old items sooner.

Food Item	**Storage time**	**Special handling**
Staples		
Baking powder	18 months	Keep covered and dry
Cereals	4 months	Keep covered and dry
Coffee cans (un opened)	1 month	Refrigerate after opening
Coffee instant (un open)	20 months	Keep lid tightly closed
Flour (all types)	1 year	Put in air tight container
Honey, jam, syrups	1 year	Keep tightly covered
Pasta	2 years	Keep tightly covered
Sugar	4 months	Put in air tight container
Tea	2 years	Put in air tight container
Chocolate	1 year	Keep in a cool place.

Canned and Dried Foods		
Fruits	1 year	Keep in a cool place
Meat & fish – canned	1 year	
Poultry - canned	1 year	
Pickles, olives	1 year	Refrigerate after opening
Vegetables – canned	I year	Keep in a cool place
Herbs and Spices		
Ketchup	1 month	
Whole spices	I year	Transfer from cartons to air tight containers, keep away from sun light
Ground spices	6 months	
Herbs	6 months	
Worcestershire sauce	2 years	

5.3.2 Refrigerator Storage

Temperature: In general foods are stored at 1º C – 4.5º C. Above this temperature food get spoil rapidly. Check the temperature with at regular intervals so that foods can be stored for longer time.

Time: Use foods quickly – do not store them for the maximum storage time.

Wraps: Use foil, plastic wrap or bags, airtight containers. When meat, poultry and fish are bought in a plastic wrapped package, loosen the ends of package to dry surface moisture, as micro-organisms grow on faster rate at most temperatures.

General care: Clean the refrigerator regularly to cut down food odors. Remove spoiled foods immediately so that decay will not be passed on to the other foods.

Food Item	Storage time	Special handling
Dairy Products		
Butter, Margarine	1-2 weeks	Keep tightly wrapped.
Butter milk, sour cream, yoghurt	5 days- 2 weeks	Keep tightly covered. Turn unopened yoghurt containers upside down to prevent surface \drying. Once opened store right side up.

Cheese	5 days – 2 weeks	Keep all cheese tightly packed in moisture resistant wrap.
Eggs	2 days	
Milk	4-5 days	Keep containers tightly closed
Fresh Fruits and Vegetables		
Apples	1 week	Sort fruit; discard bruised or decayed fruit. Do not wash before storing, as moisture encourages spoilage. Keep fruit juices tightly covered.
Cherries & berries	1-2 days	
Citrus fruits	1 week	
Melons	1 week	Wrap uncut melons like honeydew and cantaloupe to prevent odor spreading to other vegetables
Other fruits	3-5 days	Sort fruit; discard bruised or decayed fruit. Do not wash before storing, as moisture encourages spoilage.
Carrots, radishes	2 weeks	Remove leafy tops, keep in crisper.
Mushrooms	1-2 days	Do not wash before storing
Peas	3-5 days	Keep in moisture resistant wrap.
Other vegetables	3-5 days	Keep in moisture resistant wrap or bags.
Meat, Fish, Poultry – Fresh Cooked		
Beef, lamb, pork and veal chops	3-4 days	Store fresh meats loosely wrapped. Partial drying of surface increases keeping quality. In meat comes packaged in plastic wrap, loosen ends. Store in coldest part of the refrigerator or in meat keeper.
Ground meat	1-2 days	
Steaks	3-5 days	
Offals	1-2 days	

Fish and shell fish	1 day	Store loosely wrapped. Store in coldest part of the refrigerator.
Poultry	2 days	Store loosely wrapped. Store in coldest part of the refrigerator.
Cured and Smoked Meats		
Bacon	5-7 days	Store loosely wrapped. Store in coldest part of the refrigerator.
Dried beef	10-12 days	
Frankfurters	4-5 days	
Hams (whole)	1 week	
Hams (un opened)	6 months	
Sausages- fresh, smoked	2-3 days	
Canned foods after opening		
Fish and sea food	1 day	Store all foods tightly covered
Fruit	1 week	
Meats	2 days	
Poultry	1 day	
Vegetables	3 days	
Other Foods		
Coffee	2 weeks	Keep tightly covered after opening
Honey, jams	2 weeks	Refrigeration is not needed, but storage life is extended if refrigerated
Nuts	9 months	Refrigerate nuts after opening cans or packages. For longer storage freeze them.
Soft drinks	3-6 months	

5.3.3 Freezer Storage: Usually perishable foods like meat, diary products, fruits and eggs are stored at these for long shelf life and future use.

Temperature: Here the temperature is maintained at -18ºC or below. If the foods are stored above this level of temperature, micro-organisms multiply easily, when they are stored for longer periods.

Time: Date foods with an "Expiry Date" according to the maximum storage time recommend below. Longer storage is not dangerous, but at the same time flavors and textures begin to deteriorate.

Wraps: Use foil, plastic bags and wraps, freezer wraps and freezer containers for storing the food materials.

General Care: Clean the refrigerator regularly to cut down food odors. Remove spoiled foods immediately so that decay will not be passed on to the other foods.

Food Item	Storage time	Special handling
Meat, Fish and Poultry		
Bacon	1 month	If meat is purchased fresh on trays and in plastic wrap, check for holes. If none, freeze in this wrap for up to 1 month. For longer storage wrap over with plastic wrap or freezer wrap. Make package as airtight as possible. Keep Frankfurters, bacon etc, in vacuum packages to freeze. Keep meat purchased frozen in original package
Corn beef	2 weeks	
Frankfurters	1 month	
Minced beef, lamb & veal	4 months	
Minced pork	3 months	
Ham slices	1 month	
Ham whole	2 months	
Beef steak	1 year	
Lamb & veal steak	9 months	
Pork steak	6 months	
Fish	6 months	For longer storage wrap over with plastic wrap or freezer wrap. Make package as airtight as possible. Keep fish purchased frozen in original package
Clams	3 months	
Oysters	4 months	
Scallops	3 months	
Poultry	1 year	For longer storage wrap over with plastic wrap or freezer wrap. Make package as airtight as possible. Keep poultry purchased frozen in original package
Chicken livers	3 months	

Cooked poultry	3 months	
Fruits and Vegetables		
Berries, cherries, peaches, pears, pineapple etc.	1 year	
Citrus fruit and juices	6 months	
Fruit juice concentrate	1 year	
Vegetables –frozen purchased	10 months	
Dairy Products		
Butter, Margarine	9 months	Store in airtight freezer container.
Cheese	1-3 months	Do not freeze creamed cottage cheese, as it becomes mushy. Thaw in refrigerator.
Eggs with shells		Do not freeze
Egg whites	1 year	Stored in covered container. Freeze in required amounts
Egg yolks	1 year	
Ice-cream	1 month	Cover surface with plastic wrap or foil after each use to keep away from drying out.
Milk	3 months	Freezing affects flavor and appearance. Allow room for expansion in freezer container. Thaw in refrigerator.

5.4 Weights and Measures

This is very important task of cookery, particularly food production.. to obtain a standard product with standard yield, as is essential for commercial foods, weighing and measuring must be done accurately.

A set of scales, measuring jugs, and standard measuring cup and spoons must be provided in every kitchen. The scales should denote both grams and ounces and the measuring jug both liters and pints. Weighing is more accurate than measuring but for expediency, measuring can be used. When measuring, it is better to use level measurements, as this is less subject to error. Spoons and cups vary greatly in size. Therefore test them carefully and always use the same utensils for measuring.

	Approximate Equivalent	**Exact Equivalent**
¼ oz	5 g	7.0 g
½ oz	10 g	14.1 g
1 oz	25 g	28.3 g
2 oz	50g	56.6 g
3 oz	75 g	84.9 g
4 oz	100 g	113.2 g
5 oz	125 g	141.5 g
6 oz	150 g	169.8 g
7 oz	175 g	198.1 g
8 oz	200 g	227.0 g
9 oz	225 g	255.3 g
10 oz	250 g	283.0 g
11 oz	275 g	311.3 g
12 oz	300 g	340.0 g
13 oz	325 g	368.3 g
14 oz	350 g	396.6 g
15 oz	375 g	424.0 g
16 oz	400 g	454.0 g
2 lb	1 kg	908.0 g

¼ pt	125 ml	142 ml
½ pt	250 ml	284 ml
¾pt	375 ml	426 ml
1 pt	500 ml	568 ml
1½pt	750 ml	852 ml
2 pt (1 qt)	1 litre	1.13 litres
2 qt	2 litres	2.26 litres
1 gal	4½ litres	4.54 litres
1 teaspoon		5ml
1 dessert spoon		10 ml
1 tablespoon		15 ml
¼ cup		60 ml
⅓ cup		80 ml
½ cup		125 ml
1 cup		250 ml

5.5 Conclusion

The fundamental reason behind this lesson is to store the food (either in the form of cooked or uncooked) in safe, hygienic and fresh. Few foods are stored at room temperature; few are stored at refrigerator temperature and others are stored at freezer temperature. Whatever are the storage conditions, the major goal of the culinarian should be to retain the own characteristics, freshness and quality of the food stuffs. Foods are stored in specially deigned packs, so that, to increase the shelf life to the maximum possible extent and to avoid cross-contamination.

If the foods are not stored properly, the foods quality deteriorates soon and in turn it affects the quality of the prepared dishes. Now the culinarian should decide how much importance, he should give for the storage of food materials.

5.6 Self Assessment Questions

1. Write a brief note on lay-out of store room?
2. What are the different temperature zones used in hotels to optimize the shelf life of various ingredients and explain them?

5.7 References

1. Modern Cookery - Volume I by Thangam E Phillip
2. Theory of Catering by Ronald Kinton and Victor Ceserani

LESSON 6

Culinary Terms

6.0 Objectives

This lesson solely deals with culinary and service terms, that are widely used in kitchen. In this, we even study, the French names for a range of English terms and food items.

Contents

6.1 Introduction

This lesson gives a selection of common classic and other cuisine and service terms and their definitions. Many cuisine terms are derived from the classic European cuisine. French terms are used mainly because it was in France that cuisine terms were codified through, for instance, the development and publication of the Le Répertoire de La Cuisine. This is much the same as the use Italian terms for music (musical terms being codified in Italy), French terms in ballet (dance terms being codified in France) and English being the international language for aviation traffic control.

6.2 Culinary Terms

Abats Butchers suppliers such as heads, hearts, liver, kidney, etc.

Aiguillettes Thin slices of breast of poultry cut lengthwise.

A la Meaning merely “in the style of”

A la broche Roasted in front of fire on a spit or in a Dutch oven.

A la Carte Opposite of table d’hote, meaning each dish is ordered and priced individually.

A la diable The French way of saying “devilled” in other words, any very hot or highly seasoned dish.

A la francais Dishes that are prepared in the French way.

A la minute Cooked to order

Al dente Cooked so as to be slightly firm as for pasta or vegetables

Aperitif A cocktail or other drink served before a meal to stimulate the appetite.

Appetizer A titbit served before a meal or as the first course. A drink such as sherry, cocktail, etc.

Aspic A savory jelly mainly used for decorative larder work

Au bleu Applied to fish cooked in fish stock with wine added.

Au beurre With butter

Au four Baked in the oven

Au gras Rich, applied to dishes with meat in rich gravy

Au gratin Any dish covered with sauce, breadcrumbs or cheese and afterwards baked or grilled. The food is served from the dish in which it is cooked.

Au natural Simply cooked food, or food served raw, such as oysters.

Baba A light yeast cake usually soaked in rum or spirit

Bagel Type of hard bread roll

Barbecue Meat basted with a highly seasoned sauce, e.g., lamb basted hot redcurrant sauce

Barquette A boat-shaped pastry tartlet, filled with chicken, vegetables, oyster, fish mayonnaise, etc.

Baste To spoon melted fat or liquid over food during cooking to keep it moist

Béarnaise A rich sauce, resembling a hollandaise sauce. Made from butter, egg yolk and vinegar and flavored with peppercorns, shallots, chervil and tarragon.

Beat To mix air with food by vigorous motion; also used to make a mixture smooth and free from lumps. A wooden spoon is best for beating thick mixtures; an egg whisk for thin ones.

Béchamel A rich white sauce

Beignets Pancake batter fried in deep fat or fritters of different kinds.

Beurre noir Browned butter.

Beurre manie Equal quantities of butter and flour used for thickening sauces

Bien cuit 'Well done' grilled steak

Bisque A rich thick cream soup usually made from shellfish e.g. lobster.

Blanquette A white stew cooked in stock from which the sauce is made

Blend Two combine two or more ingredients.

Blinis Small thick savory buckwheat pancake. Accompaniment to caviar.

Bouchees Small patties of light pastry sufficient for one mouthful.

Bouillabaise Mediterranean fish style stew flavored with herbs

Bouillon Unclarified broth or stock made from fresh meat.

Bombay duck Small, dried, salted fish; fried it is used as an accompaniment to curry dishes

Bombe An ice-cream specialty of different flavors in bomb shape

Bouquet garni A faggot of herbs: e.g. parsley stalk, thyme and bay leaf, tied in pieces of celery and leek

Brioche Very light French rolls

Brine A preserving solution of water, salt, saltpeter and aromates used for meats (silverside, brisket, tomgue)

Broil To cook by exposing food directly to heat; used synonymously with grill.

Brunoise Cut into small dice.

Casatta Layers of different ice-creams, flavored with liqueur and often containing glace fruits

Casserole An earthen ware fireproof dish with a lid

Canapés Small pieces of toast, fried bread or pastry on which little savories are served.

Carte de jour Menu for the day.

Cannelloni Small pasta rolls filled with mince (Italian)

Caramel A substance made by heating sugar until it turns dark brown used for coating moulds, flavoring dishes etc.

Cava ire Salted roe of sturgeon or similar fish.

Celestine Garnish of strips of savory pancake

Cepes A kind of mushroom

Cereals Grains such as wheat, including semolina, oats, barley, rye, rice etc.

Chateaubriand Head of the fillet of beef.

Chaud-froid A cold sauce used for coating meat, game or fish.

Chiffonade Mince of sorrel, lettuce etc. wash the leaves, remove veins, roll and cut into fine strips with a sharp knife.

Chinois A conical strainer.

Chipolata A kind of small sausage.

Chow mein Fried noodles with green vegetables and usually meat

Cisel Finely chopped vegetables.

Clarification	To make clear such as stock, jelly, butter
Cocotte	Porcelain or earthenware fireproof dish
Compote	Fruit stewed in syrup.
Concass	To chop roughly. E.g. concassed tomatoes.
Condé	Cold sweet made of poached fruit and a creamy rice e.g. Pears
Condiments	Spices and seasonings.
Consommé	A light-colored clear soup.
Contrefilet	Boned out sirloin of beef
Coupe	A cream or water ice served with fruit.
Court bouillon	A well flavored cooking liquor for fish.
Cream fat	To beat fat with a wooden spoon until it is light and fluffy.
Crecy (a la)	Dishes containing carrots.
Crème fraiche	Whipping cream and buttermilk heated to 24°-29° C (75°-84° F)
Crepe	Pancakes.
Croissants	French rolls, crisp and light.
Croquettes	Cooked foods molded into cylinder shape, coated in flour, egg, crumbed and deep- fried
Croutes	Ovals or rounds of fried bread.
Croutons	Bread cut in to dices or fancy shapes and fried or toasted.
Crudites	Small neat pieces of raw vegetables served with a dip as an appetizer
Cut and fold	To mix flour very gently into a mixture.
Dariole	A small cup-shaped mould.
Darne	The middle slice of a fish.
Devilled	The same as a ‘a la diable’, that is, any highly seasoned dish. Often this seasoning is done with some form of curry powder.
Dredge	To cover with a thin sprinkling.
Dust	To sprinkle lightly with fine sugar, dried milk or flour.
Duxelle	A mixture of parsley, mushrooms and shallots used for flavoring sauces and purees or as forcemeat.
Emulsion	A mixture of oil and liquid (such as vinegar), which does not separate on standing (mayonnaise, hollandaise)
Entrée	A meat dish served with a sauce made up of small cuts of meat or poultry; formerly regarded as an intermediate dish, it is mow a day frequently served as main course.
Entrecote	A steak cut from a boned sirloin

Entremets Hot or cold sweets

Escalope Thin slices of meat dipped in egg and breadcrumbs and then fried.

Farci Any kind of stuffing

Fennel A fragrant herb used for flavorings sauces (saunf)

Fillet To bone fish, etc. and cut in to fillets.

Flan A pastry case made in a flat tin and afterwards filled with a sweet or savory mixture.

Flute A long crisp roll of bread (French) used to garnish soups.

Foie gras Liver of a fat goose.

Fondant Sugar boiled to 112c and then beaten to a fudge like smoothness. It can be used as an icing or any kind of sweet.

Forcemeat Savoury stuffing.

Frangipane Confectioner's custard.

Frappé Chilled, e.g. melon frappé

Fricadelles Braised game or meat in very small pieces.

Fricassée A white stew in which the meat, poultry or fish is cooked in the sauce

Fritters Fruit, meat, vegetables/fish coated with batter and fried. Usually in deep fat.

Frosting A cooked or uncooked icing used to cover and decorate cakes, etc.

Fumet: A kind of essence from fish, game, etc.

Galantine fine cold dish of poultry or meat, boned, stuffed, braised in concentrated stock and then coated with aspic and garnished ingredient which decorates , accompanies or completes a dish.

Garnish To decorate.

Garniture Decoration.

Gateau This can be a cake, an ice cream or anything made in the shape of a cake and lavishly decorated.

Genoese A rich batter sponge used as a base for gateaux and as a base for Savoy fingers.

Giblets The heart, liver and gizzard of poultry used to make gravies, soups and pies.

Glace Ice cream, icing. To make smooth or glossy wit icing or jelly.

Glaze Meat glaze is made by reducing (by boiling) stock or gravy to the consistency of jelly.

Gluten Protein substance found in wheat flour

Gnocchi	classified as a farinaceous types of dish, made from semolina or other flour bases
Goulash	Hungarian meat stew, flavored with paprika.
Hors d'oeuvre	Appetizing first course dishes, hot or cold
Haricot	A type of stew. Literally means "beans".
Infestations	Insects breeding on the premises
Infusion	The liquid extraction derived from steeping a substance such as coffee, tea, herbs, etc. in boiling water.
Jardinière	Vegetables cut into batons
Jugged Hare	Hare cooked in a casserole in its own blood with wine, seasonings and vegetables.
Jus	Gravy.
Kebab	Small, evenly cut pieces of meat or fish with vegetables cooked on a skewer – usually grilled.
Kedgeree	Savory dish of cooked rice, mixed with hard boiled egg, smoked fish and may be flavored with either turmeric or saffron.
Kirsch	A favorite drink of the continent is café kirsch; this is made with half a cup of black coffee and half a cup of cherry brandy. Also a cherry cordial.
Kosher	Meat killed and food prepared according to Jewish law
Kromeskies	Croquettes dipped in yeast batter and fried.
Larding	Inserting strips of fat bacon into meat
Liaison	Mixture of eggs and cream used for thickening white sauces and soups.
Marinade	A mixture of vinegar, or wine, oil, herbs, spices, etc. in which fish or meat is soaked before cooking to improve flavor and texture.
Marinate	To soak fish or meat in a marinade.
Marjoram	A lemon-scented herb.
Marmite	Stock pot
Marzipan	A sweet or icing made of almonds ground to a paste with egg.
Meringue	A mixture of stiffly beaten egg white and sugar, often used as a garnish when browned in the oven. It can be made into small cakes and afterwards filled with cream.
Mignotte pepper	White pepper corns, coarsely ground.
Minestrone	Italian soup with many vegetables and macaroni added.
Mirepoix	Roughly cut onions, carrots, celery and a sprig of thyme and bay leaf.

Mise-en-place A general name given to the elementary preparation area, which is constantly resorted to during the various stages of most culinary preparations.

Mocha A flavoring usually made with a coffee infusion.

Mortadella large Italian sausage that has been lightly smoked

Mousse A light spongy dish made with sweetened and flavored cream, then whipped and frozen. Can also be made with a mixture of meat, vegetables, etc. mixed with gelatine.

Mousseline Same as above but moulded in small quantities. Enough for one person at a time.

Muffin A drop batter baked in small individual moulds and eaten hot with butter.

Napper To coat or mask with sauce

Navarin Mutton or lamb stewed with turnips.

Nougat A sweet of a fairly rich kind made with almonds, sugar, nuts, cherries and honey.

Nouvelle Cuisine Form of French cooking that promotes healthy foods and lighter sauces to replace those very rich dishes of the traditional classic French Cuisine

Pailles Potato straws.

Panada A thick paste of flour and liquid or flour and butter with a little liquid used to bind together ingredients, which would fall apart, by themselves.

Parboil To boil food until partly cooked.

Parfait Ice cream served in a tall glass and decorated with a variety of nuts and fruits

Parmesan A very hard cheese made in Italy from cows milk. Used mainly for cooking.

Parsley butter Butter containing lemon juice and chopped parsley

Panée A food item floured, egg and bread crumbed and fried

Pâté Pie, pastry or raised pie or a paste.

Paupiette A stuffed and rolled strip of fish or meat

Petits fours Very small pastries, biscuits, sweets and sweetmeats

Piquante Sharply flavored. Usually the word is applied to mustard or sharp sauce.

Plat du jour Special dish of the day

Poppadums Dried, thin, large round wafers made from lentil flour, used as an accompaniment to Indian dishes

Printanier Garnish of spring vegetables

Profiterole A small choux pastry bun filled with cream and coated with chocolate

Profiteroles Small balls of choux paste often stuffed and used as garnish for soup but also a sweet of the same name where rolls are stuffed with cream and served with chocolate sauce.

Pumpernickel A dark brown or black rye bread. May be used as a base for canapés

Puree A smooth mixture obtained by rubbing cooked fruit, vegetables, etc. through a sieve.

Quenelles Forcemeat or meat, fish, game or poultry, pounded, rubbed through a sieve and formed in to balls, then poached or fried.

Ragout: Well-flavored meat stews. Thick, well seasoned and rich.

Raising agents	Substances, which produce a gas when acted on by heat, or other substances, and make flour mixtures rise, e.g. baking powder. Baking soda, yeast.
Ramekins	Individual small baking dishes.
Raspings	Very fine bread crumbs obtained by grating stale or over-dried bread on a fine grater.
Ratatouille	Vegetable stew flavored with ground pepper and garlic
Rechauffe	A re-heated dish.
Risotto	Savory rice dish containing vegetables and cooked in stock
Rissole	A cake or meat or fish in a pastry case.
Roe	Eggs of fish.
Roulade	A stuffed roll of food that may be sweet or savory i.e. a thin slice of meat stuffed and rolled or a thin flat sponge filled with cream and rolled.
Roux	A thickening of cooked flour and fat
Sabayon	Yolks of eggs and a little water cooked until creamy.
Saccharometer	An instrument for measuring the density of sugar
Saffron	The dried stigma of the crocus flower, used for adding color and flavor.
Salmi	Partly roasted game made into a rich stew.
Sauté	Tossed and lightly browned in shallow fat.
Sherbet	Frozen mixture of fruit juice, egg whites, sugar, milk ore water.
Shortening	Fat suitable in baking is sometimes called this.
Shredded	Cut into fine strips. E.g. lettuce, cabbage, etc.
Sift	To put dry ingredients through a fine sieve.
Simmer:	To cook a liquid, at a temperature just below boiling point.
Singe	To brown or color.
Skewer	A long pin of wood or metal used to secure meat or poultry while cooking.
Skim	To remove impurities and fat from the top of the soups and broths, being cooked for a long time, by means of a skimming ladle
Sorbet	A half-frozen water ice, served in the middle of a long dinner.
Soufflé	Very light baked or steamed pudding, savoury or sweet, usually puffed with egg whites.
Soya sauce	Made from Soya beans and used extensively in Chinese cookery
Steep	To soak in hot or cold liquid.
Stew	To cook by simmering in a little liquid.

Strain To separate the liquid from the solids by passing through a strainer

Tabasco Pungent Indian pepper sauce, also used extensively in countries with a hot-climate.

Table d'hote A meal at a fixed price; a set menu

Tandoor Open topped clay oven

Tartare A cold, sharp, savoury sauce with a base of mayonnaise served with fried fish or a meat dish.

Temperature The degree of heat, usually measured in degrees Celsius (centigrade) or Fahrenheit as ºC or ºF. Thus, Temperature of boiling water is 100ºC or 212ºF, Temperature of simmering water is 85ºC or 185ºF

Terrine An earthenware dish used for cooking and serving pâté.

Tepid The temperature of a mixture of 2 parts of cold water to 14 part of boiling water, that is about 26.6c or 80f.

Terrine A baked, savoury meat or game mould, which is cooked in the oven, usually in earthenware.

Timbale A cup-shaped mould, usually made from meat, fish or vegetables, added to a custard mixture and finely decorated.

Tortilla originating in Mexico. This is a round, flat pancake made from cornmeal and normally filled with beans or meat and a sauce.

Tournedos Small fillet steak cut from the middle of tenderloin (nearly 65mm. (1/4") thick and about 6-7cm. (2 ½ to 2 ¾ ins.) in diameter.

Trancon A slice of flat fish on the bone.

Truffle an edible fungus found underground, especially near the roots of oak trees

Truss To tie up or skewer a bird ready for the oven after plucking and drawing.

Tutti-frutti Mixed fruit.

Vanilla A flavoring generally used for cakes, ices or puddings.

Veloutes A rich, creamy smooth sauce.

Vol-au-vent Creamed game, meat or fish served in a pastry case.

Yoghurt An easily digested fermented milk product

Zest Thin outer skin of oranges and lemons.

6.3 French Terminology

Meats and Sea foods

Beef	Boeuf
Veal	Veau
Pork	Porc
Lamb	Agneau
Chops	Cotelettes
Turkey	Dindon
Mutton	Mouton
Chicken	Poulet
Duck	Canard
Duckling	Caneton
Goose	Oie
Gosling	Oison
Spring Chicken	Poussin
Hare	Lièvre
Rabbit	Lapin
Venison	Venaison
Wild duck	Canard sauvage
Quail	Caille
Partridge	Perdreau
Pheasant	Faisan
Snipe	Bécassine
Barbel	Barbeau
Bream	Brème
Brill	Barbue
Cod	Cabillaud
Eel	Anguille
Haddock	Aiglefin
Halibut	Flétan
Herring	Herang

Lemon Sole	Limande
Mackerel	Rouget
Plaice	Plie
Salmon	Saumon
Salmon Trout	Truite Saumonée
Smelt	Eperlon
Skate	Raie
Sole	Sole
Sturgeon	Esturgeon
Trout	Truite
Turbot	Turbot
Whitebait	Blanchaille
Whiting	Merlan
Crab	Crabe
Crayfish	Ecrevisse
Crawfish	Langouste
Lobster	Homard
Mussel	Moule
Oyster	Huître
Prawn	Crevette rose
Shrimp	Crevette grise
Scallop	Coquille St Jacques

Vegetables

Artichoke Globe	Artichaut
Asparagus	Asperge
Aubergine	Aubergine
Beetroot	Betterave
Brussels sprout	Chou de Bruxelles
Cabbage	Chou
Pimanto	Piment
Chilli	Chili
Cauliflower	Chou-fleur

Carrot	Carotte
Celery	Céleri
Celeriac	Céleri-rave
Cucumber	Concombre
Chicory	Endive belge
Endive	Endive
French Bean	Haricot Vert
Leek	Poireau
Lettuce	Laitue
Mushroom	Champignon
Onion	Oignon
Pea	Petit Pois
Parsnip	Panais
Pumpkin	Citrouille
Shallot	Echalotte
Spinach	Epinards
Sweet corn	Ma¿s
Tomato	Tomate
Turnip	Navet
Vegetable Marrow	Courgette

Fresh Herbs

Bay leaf	Laurier
Chevril	Cerfeuille
Fennel	Fenouil
Garlic	Ail
Mint	Menthe
Parsley	Persil
Rosemary	Romarin
Sage	Sauge
Thyme	Thym
Tarragon	Estragon

Fruits

Apple	Pomme
Apricot	Abricot
Blackberry	Mûre
Cherry	Cerise
Cranberry	Airelle Rouge
Currant	Groseille
Grapes	Raisin
Melon	Melon
Peach	Pêche

6.4 Conclusion

Words for food and methods of cooking listed above are intended to constitute a basis for the sound knowledge of various common culinary terms used in the kitchen. Knowledge of these terms, not only helps the culinarian to understand the kitchen language, but also to achieve the accuracy in the preparation of dishes. These terms even provide a common platform for the kitchen staff to communicate with each other.

6.5 Self Assessment Questions

1. Explain the following culinary terms

Abats	Aboyeur	Glacier
Saucier	Larding	Fond de blanc
Chinois	Terrine	

6.6 References

1. Modern Cookery - Volume I by Thangam E Phillip
2. Theory of Catering by Ronald Kinton and Victor Ceserani
3. Theory of Cookery by Krishna Arora
4. The Art and Science of Culinary Preparation by Jerald W Chesser

LESSON 7

Kitchen Organisation

7.0 Objectives

- To discuss the organization of food production department
- To introduce and discuss various positions in the kitchen and their responsibilities

Contents

7.1 Introduction

The aim of kitchen organization is to assign or allocate jobs so that they can be done efficiently and each employee knows his jobs and responsibilities and the result expected from him or her.

There are various factors that affect the number of staff working in a kitchen. All have to be considered while staffing of the department. They include the menu, type of establishment, size of the operation and the physical facilities.

The Menu: The kind of dishes to be produced determines a lot of things like planning, organizing and operating a food production department. In simple, menu is the basis for the whole operation.

The Type of Establishment: The number of employees in a kitchen also depends on the type of outlet they are working for. Different establishments include:

- Hotels
- Institutional Kitchens: Schools, Hospitals, Industrial Cafeterias, Airline Catering, Military, Cruise lines etc.
- Catering and banquet services (Outdoor or Off-premises Catering)
- Fast food Restaurants.
- And many more…

The Size of the Operation: Size implies the capacity of the business i.e., the volume of business expected.

The Physical Facilities: This includes the type of equipment used. A kitchen less mechanized need more staff than a kitchen, which is fully mechanized.

Even though, all the above stated factors are kept in mind, it may not finally decide the number of staff being employed. There are no set rules and regulations regarding how many staff are required by a particular organization. Each establishment will have its own policy, which determines the factor about how many staff are required.

The latest trend is to employ staff depending on the size of the operation. The volume of production is considered as the main factor that is determining the number of staff to be employed. Also the factor pertaining to the contribution of a particular section to the menu must be considered.

Even when there are two kitchens of a similar nature, the internal organization may vary as each Chef de Cuisine will have his own way of running his kitchen. It has been found most satisfactory in organizing the work of a kitchen is to divide it into 'Parties' or 'Corners'.

The parties system was perfected by Escoffier and it was the result of studying about the food production and the recipes allocating tasks to different specialists so as to help produce the more complex dishes regularly, effectively and swiftly. The kitchen was divided into sections, each one of which was responsible for a particular contribution to the entire food production system.

In the kind of kitchen Escoffier organized, the parties system reached the height of complexity because the end-products had to be of the highest finish and yet be combined to order in rapid sequence for a substantial number of customers. A set pattern was made.

Basically the principles of kitchen organization represent a standard practice though there are no set rules for deciding how many sections and how many staff a particular kitchen requires. Each catering establishment has different factors to be taken into consideration such as extent of menu, number of persons to be served and management policy.

The number of staff in a section is determined by the amount of work to be done and importance of the contribution of the section to the menus and the skill of work. The base of different kitchen organizations is taken from the Traditional Kitchen Organization that was pioneered by Auguste Escoffier, the instigator of the partie or corner system. He had many sections such as grill, roast, vegetable, fish, sauce, soup, larder, patisserie, etc. As everything was done manually it was necessary but now the sections have become fewer, because of labor saving machines, convenient foods and combined catering equipment (microwave cum convection ovens, etc.), and the changing of public taste, which seeks simpler menus and meals.

7.2 Classical Kitchen Brigade

7.2.1 Chef de Cuisine:

a) Fully responsible for the efficient running of the kitchen.

b) Must be an expert I culinary skills as well as a good administrator.

c) Must have a good knowledge on economy and efficiency.

d) Must be fully acquainted with the present market process, trends, various commodities and customer trends and demands.

e) Forecasting, organizing and supervising various events.

f) Responsible for staffing, training, selection, duty rosters and dismissal of staff.

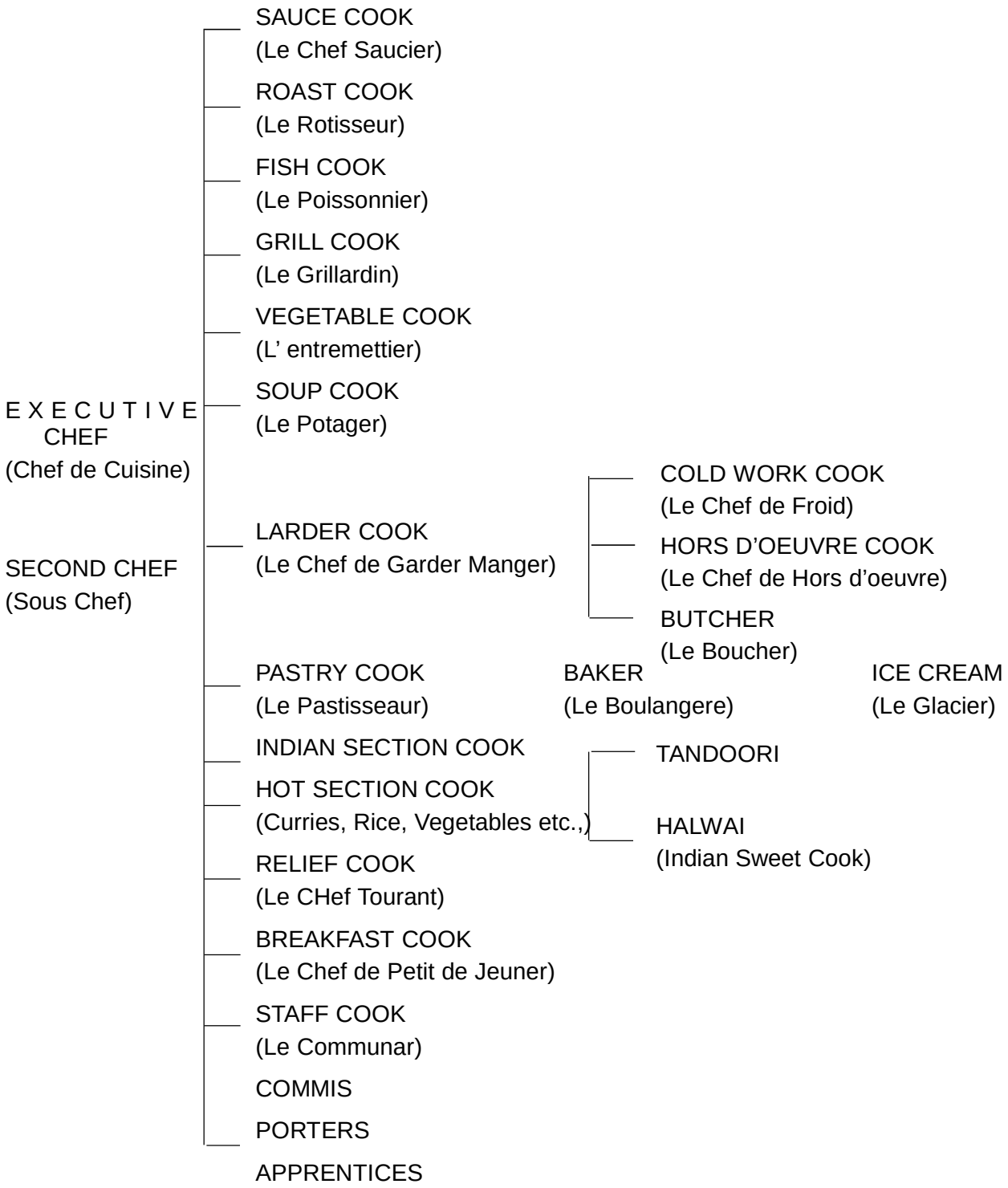
g) Ensuring that proper hygiene standards are followed in the kitchen.

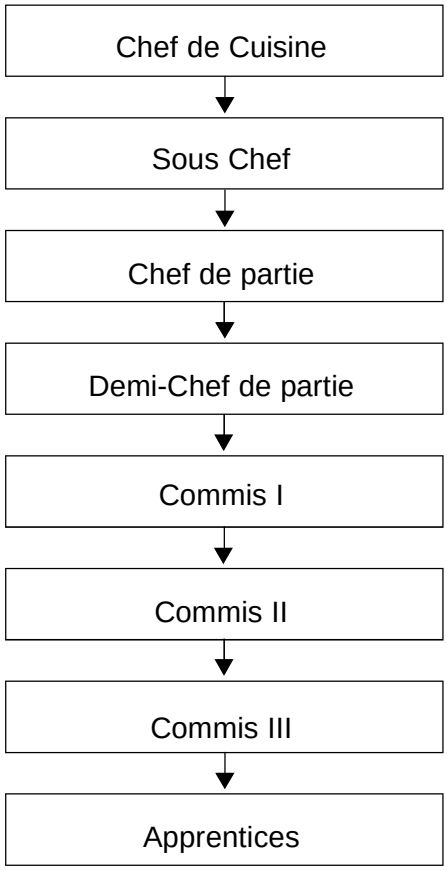
h) Menu planning, purchase of equipments and proper cost, quantity and quality control are other responsibilities.

7.2

Organisation of a large Kitchen

(LA BRIGADE DE CUISINE)





7.2.2 Sous Chef:

a) He understudies the Executive Chef in all his duties.
b) Mainly responsible for the day-to-day functioning of the kitchen.
c) He supervises the practical aspects of the kitchen.
d) In the absence of the Chef, he takes charge of the department.
e) In large establishments, there may be a number of sous chefs each for one separate kitchen like coffee shop, restaurants and banquets.

7.2.3 Chef-de-Partie:

a) For different sections, there are chefs in charge, called as chef-de-partie.
b) Each CDP depending on the importance and workload of the station is assisted by one or more Commis named as Commis-I, Commis-II and Commis-III and Trainee cooks.
c) His responsibility mainly is to see that the station is functioning officially.
d) In charge of indenting, planning staff schedules etc for his section.
e) Reports to the sous chef and co-operates in the overall smooth operations of the section.
f) In some kitchens, depending, on the business, there will be two brigades headed by two CDPs working in shifts.
g) This is very efficient as the duties are streamlined and split and ensuring more efficiently.

h) A CDP can be regarded as a Supervisor or a Foreman and also a skilled craftsman.

Chefs' of various Sections

7.2.4 The Sauce Chef or Saucier (so-see-ay): He prepares sauces, stews and hot hors d'oeuvres, and saute's food to order. He prepares his own mise-en-place, for many items he will receive like steaks prepared from larder, etc. the sauces prepared must be distinctive but not overpowering. This is usually the highest position of all the stations.

7.2.5 The Fish Cook, or Le Poissonier (pwah-so-nyay): is in-charge of all the fish preparations. The fish prepared comes from the larder and the chef does the cooking, garnishing, saucing and the dishing of fish.

The repertoire of fish dishes and their accompanying sauces is very challenging and extensive training and judgement are required from this chef.

7.2.6 The Vegetable Cook, or L'entremettier (awn-truh-met-yay): He prepares vegetables, soups, starches and eggs. In large kitchens, these jobs are handled by three persons i.e., the vegetable cook, the fry cook and the soup cook.

7.2.7 The Roast Cook, or Le Rotisseur (ro-tee-sur): This chef prepares all roasted and braised meats and their gravies and broils meats and other items to order. In case of a large kitchen, a separate cook handles broiled items, called Broiler Cook or Grillardin (gree-ar-dan) are appointed. This cook also may prepare deep-fried meats and fish.

7.2.8 The Soup Cook, or Chef Potager: The soup cook prepares all types of soups, and is responsible for the garnishes accompanying the soups. The chef sometimes begins work early; the work of the potager is important as soup gives an Impression of the meal to follow

7.2.9 The Larder chef or Chef Garde-manger (gard-mawn-zhay): He is responsible for the production of all cold preparations, which includes salads, salad dressings, cold hors d'oeuvres, pates and buffet foods. He is also in-charge of the butchery. Most of the processed meats storage and processing are his responsibilities.

The larder cook is the most spectacular and the busiest, because the work is never ending. Besides feeding the main kitchen with prepared foods for processing, he has to keep the cold buffet supplied.

He has a wide range of work to do, as the larder has various subsections such as hors d'oeuvre, a salad section and a butchery section.

7.2.10 The Pastry Chef or Le Patissier (Pa-tees-syay): the pastry cook has different status, but certainly not less than the sauce cook and the larder cook. His work is specialized, and he prepares hot and cold puddings, cakes, pastries, bread, etc. he is also responsible for special display work and the supply to the main kitchen items of pastry.

7.2.11 The Relief Cook, Swing cook or Tournant (Toor-nawn): His main responsibility is to relieve or replace any station head. He takes over a section when its chef goes on leave or has an off day. This chef is usually a senior and capable of working in various sections.

7.2.12 Chef de Banquet or Baquet Cook: In many of the large hotels with extensive banquet commitments, the brigade will have a Banquet chef and one or two commis working under him.

The Banquet chef is responsible for organizing the service area, coordinating with the Chef de Partie's, the time of service, numbers for the arrival of various dishes to the service area. He further arranges, to what point the dishes are finished and make the necessary arrangements to carry out completion at the service point.

Sometimes, he has to move service staff from one point to another, i.e. there may be a established banquet service point in the larder, another in the pastry section, apart from the main service area in the kitchen allocated for this purpose.

7.2.13 The Breakfast cook or Chef de Petit de Jeuner: He commences his duty very early. He does not rank as a chef de partie, but nevertheless needs to be of good skill, within his limited field. He is responsible for the complete breakfast service. Afterwards he has to complete his mise-en-place for the following morning. Some times he may assist soup cook or vegetable cook, after completion of his work.

7.3 Conclusion

Kitchen organization is essential for smooth and successful running of the establishment. To organize the staff, the basic tool of management is organization chart, which shows the structure of an organization in terms of how the various outlets and job positions in a kitchen are linked together.

There are countless duties that must be accomplished in any job, and it is necessary for culinarian to know the specific duties and job responsibilities of each and every position in the organization.

This knowledge helps the culinarian to perform the duties without second thought, hen he/she is in that particular position.

7.4 Self Assessment Questions

1. Draw the hierarchy of kitchen brigade for a large organization hotel?
2. Describe the duties and responsibilities of Executive chef and Chef de partie?
3. Describe the job responsibilities of chef saucier, chef garde manger, chef tourante and chef petit dejeuner?

7.5 References

1. Theory of Cookery by Krishna Arora
2. The Art and Science of Culinary Preparation by Jerald W Chesser

LESSON 8

Sections of Kitchen and Their Coordination with other departments

8.0 Objectives

- To introduce and discuss the function of various kitchen outlets
- To describe the co-ordination of kitchen with other departments

Contents

8.1 Introduction

Food Production department is one of the major non - revenue-earning departments. This department in a star category hotel is normally divided into clearly demarcated areas for ease of operation and guest convenience.

8.2 Various Sections of Kitchen

8.2.1 Larder: Larder in simple means “food storing place”. But in the broader sense, in professional kitchens, it has a broader meaning. It is just not a storing place but a place where all raw materials are prepared and dressed before cooking. Depending on the size of the establishment, the work of larder may be broken down into various sections again. The duties and functions of larder department include storage of perishable foods, both raw and cooked, which include foods such as meat; fish, poultry and game are prepared and made ready for cooking. Also in this department all the cold foods on the menu like hors d’oeuvres, cold fish, or meat dishes, salads etc. are prepared. This section includes butchery, garde-manger mainly where all the foods are processed and stored.

8.2.2 Sauce Section: The section is responsible for providing all meat, poultry, and game and offal dishes with the exception of those that are plain roasted or grilled. All the meat dishes cooked and garnished here. Also all sauces served hot required by various sections of the kitchen

are prepared in this section of the kitchen. Cooking by braising, boiling and peeling is done in this section but not roasting and grilling.

8.2.3 Roast Section: As the name implies, all roast dishes of meat, poultry and game are done in this section. Grilling also is the responsibility of this section. Also cooking by deep-frying is done in this section. It also prepares and finishes any savouries that are required.

8.2.4 Fish Section: This section is responsible for the provision of all seafood preparations in the menu except for those that are grilled or deep-fried. Ofcourse, the cleaning, descaling, filleting, crumbing i.e., processing of fish is done at the fish mongery in the larder.

8.2.5 Vegetable Section: This section handles the preparation of all entremets, which are done skillfully and served as a separate course. Also, this section prepares the various vegetable and potato accompaniments in the menu. Peeling. Cleaning and trimming and cooking of vegetables is done here. Other responsibilities like preparing all the egg dishes and pasta cooking and rice cooking for various sections are also done in this section.

During the period of service, each day various quantities of vegetables are prepared, cooked, refreshed and placed into refrigerator. The mise-en-place is carried out according to the requirements of the menu.

Management of cooking vegetables well for large numbers calls for particular knowledge, skill and judgement and should never be entrusted to an unskilled and disinterested cook.

8.2.6 Soup Section: Preparation of all types of soups like consommé, crams, veloutes, purees, broths, bisques and International soups are a major responsibility of this section. All the basic stocks required are also prepared here. Also cold soups are done here and sent to the larder for service.

8.2.7 Indian Section: This section is responsible for the preparation of all Indian dishes. The work may be subdivided into subsections such as Indian (rice, pulaos, bityanis, chapaties, bhaturas, etc.), Tandoor (kababs. tikkas, tanddor chicken etc) and Halwai (all Indian sweets like Jalebis, rabri, rasgulla etc.)

8.2.8 Pastry Section: This section is normally separate from the main kitchen and is a self-contained section with its own cold storage etc. the main function of this section is to prepare hot and cold desserts, for lunches, dinners and pastries for tea-time and other occasions. Various pastries like short crust, puff and desserts like mousses, soufflés etc. are also prepared here. All decorative works like sugar confectionery, chocolate work etc. are also carried out in this section.

Sorbets and water-ice like items are made in pastry section. The service of ices and those sweets which are based upon ice-cream are prepared and assembled in patisserie. They also include sweets like Omelet au surprise, and soufflé surprise, melbas etc.

Some hotels also attach the bakery with this section. The responsibility of this section lies under the Pastry Chef or Head Baker.

8.3 Kitchen Organization and Layout

8.3.1 General Layout of Kitchen in various Organizations: In any catering establishment, a schedule for kitchen maintenance is essential. The term “Layout” means the positioning of work centers and their arrangement with respect to equipment and services like drainage, fuel supply etc., in the kitchen. The work centers in the kitchen layout should be positioned with four basic concepts in mind.

a) Smooth Work Plan.

b) Avoidance of congestion at worktables.

c) Provision of comfortable environment for work.

d) Observing the principle of hygiene and sanitation.

The main work centers are:

a) Preparation center for meat, fish and poultry.

b) Preparation center for vegetable and fruits.

c) Cooking centers

d) Holding, Service or dishing out center.

e) Washing up or sink center.

The points to remember for successful layout of kitchen:

a) The placement of equipment in center should allow plenty of space around them for cleaning.

b) Units built into walls help to save space in small kitchens.

c) Freestanding equipment rather than placed flat on the floor is more hygienic.

d) Easy to clean and work in.

e) Wet preparations and cooking units near external walls be avoided to prevent damage to drainage pipes.

f) Walls and floorings should not have sharp turns and all areas should be visible to people.

g) Layout should ensure that food is not handled repeatedly.

8.3.2 Lay out of Receiving Area: A good receiving area needs to be designed for easy receipt of supplies with near be storage facilities suitably sited for distribution of food t preparation and production areas. A straight line lay out would be suitable for a snack bar while an island lay out would be more suitable for hotel restaurant. Hygiene must be considered so that kitchen equipment can be cleaned and all used.

8.3.3 Lay out of Storage Area: It is necessary to provide storage facilities at every work center in the kitchen for keeping small equipment, utensils, crockery, cutlery, daily use food ingredients, pots, pans, ladles, kitchen clothes and knives.

The storage provided can take the form of built in wall cupboards, cabinet and drawers under work tables, shelves, racks or hooks on walls or inside cabinet or cupboard doors, covered bins for storage of waste materials.

Store lay out should aim at reducing mental and physical strain, time and effort of store staff in locating items when required or placing them correctly on delivery. A make up counter the center is often necessary for holding.

Commodities before they can be arranged in their assigned places in the store or issued directly to use departments. There are some features that are necessary and followed in storage:

a) Structural feature.

b) Lighting- Fluorescent Lamp Fittings.

c) Ventilation- Window exhaust fans.

d) Dimension for storage. For example, some dimensions for movements in store room are given

Physical Layout	**Measurement**
Width of gangway	90 cm
For one person movement	60 cm
For one person carrying load	65 cm
For two persons with load to pass	90 cm
For two hand trucks	2 m

8.3.4 Lay out of Service and Wash Up: Service and dining areas are to be located adjacent to kitchen or food production areas and clearing up or dishwashing areas. These areas depend on the catering policies of the establishments. All entrances should be located nearest to the service counter and exits on the sides nearest to clearing areas. Cross traffic should be avoided.

Washing up areas are also near by to the kitchen and dining areas. All materials used should be easy to clean. Floors and walls should be hard because of the heavy use of furniture and dropping of sharp knives and other cutlery by customers. Worn out parts of the flooring or walls should be easy to replace.

All areas exposed to the customers must be made as attractive as possible in terms of colour, design and décor.

8.4 Hot plate/ Service Area

The hot plate may be regarded as the meeting point of the food service staff and the food production staff. Active co-operation and a good relationship between these two service areas helps a great deal to ensure that the customer receives an efficient and quick service of the meal, from a polite courteous waiter who has not been ‘roused’ because of bad service at the plate. This co-operation will also ensure that all the dishes served are well and attractively presented.

Generally the hot plate itself is stocked with all the china necessary for the service of a meal. This would include some or all of the following items like soup plates, fish plates, joint plates, sweet plates, consommé cups, soup cups etc. The silver required for service is often placed on the top of the hotplate and used as required. The hotplate is usually gas or electrically operated and should be lit/ switched on well in advance of the service to ensure all the necessary china and silver is sufficiently heated.

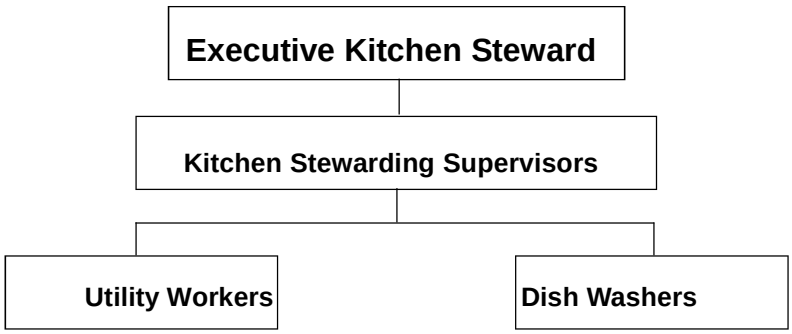
Aboyeur or Barker is the in charge and controls the hot plate over the service period. He is the person who initially receives the food check from the waiter. He checks that it is legible and that none of the dishes ordered are 'off' the menu. Then the order from the various 'corners' of the kitchen is called up, as each particular dish is required. As soon as the order is ready in the production department, he collects the dish place it on the hot plate and even passes the same information to waiting staff, so that delay in service is avoided. As he controls all the activities in kitchen, he stands in a prominent position for all to see.

8.5 Kitchen stewarding / Wash Up

Kitchen stewarding department plays an important role in the functioning of both food production and food and beverage service departments. It is headed by Executive Kitchen Steward who reports to the food and beverage service manager. Several shift supervisors work under the chief kitchen steward and each of them is responsible for carrying out the assigned tasks. Each supervisor has a team of utility workers who have to be trained and supervised effectively to ensure that they do the jobs assigned to them properly.

Though the operations of the kitchen stewarding department are mainly in the back area, it is still one of the most important departments. Strict vigilance can control wastage and keep costs down by monitoring breakage, controlling supply of gas and coal to the kitchen. It works in liaison with the maintenance department for preventive maintenance and getting equipment repaired when necessary.

Organization chart of Kitchen Stewarding department



8.5.1 Objectives of Kitchen Stewarding

To improve efficiency in the food and beverage production

- Keep all working areas clean and free from dirt and grease
- Keep production equipment area clean
- Maintain high standards of hygiene and sanitation.
- Ensure proper garbage disposal to prevent cross – contamination,
- Provide clean pots and pans for production of food for consumption, and
- Provide equipment required for food preparation.

To maintain high standards of sanitation

- Keep all working areas clean
- Keep all walk-in coolers clean

- Keep all equipment clean
- Clean machinery, especially in the areas of butchery, masala grinding, bakery etc.
- Keep all utensils spotlessly and hygienically clean.

To reduce food cost

- Provide proper equipment, i.e. for portion control
- Provide clean equipment as dirty equipment may cause spoilage and hence affect food cost
- Recycle portion-packs like sugar, sauce etc.
- Provide equipment at the right time; for instance, if a chef is searching for a small container and does not find one, then he may just get rid of the remaining and thus cause wastage
- Check garbage bins for pilferage and wastage, and
- Help ensure quick service so that more covers may be sold in the restaurant.

To keep the operational and equipment cost low

- Conduct check on equipments as per schedule
- Conduct surprise checks on equipment
- Coordinate with the chef and the engineering department in case of any maintenance problems, and
- Ensure periodic servicing of equipment, and replacement if necessary

To maintain a smooth flow at the employee cafeteria

- Check daily requirements of the cafeteria
- Maintain hygiene
- Make sure food is served on time
- Keep the cafeteria clean
- Keep all equipment clean.

To avoid accidents and fire hazards

- Check equipment for gas leakages
- Store solid fuel and coal in safe areas
- Ensure fire extinguishers are properly placed, and have them refilled immediately after use.
- Keep working areas clean and free from grease

8.5.2 Dish Washing Methods

The object of dish washing or cleaning utensils is to remove any dirty material from them on which micro-organisms can develop, and to destroy any micro-organism which are already present in the service ware by sterilizing.

These objectives can be achieved by

- Manual Dishwashing
- Mechanical Dishwashing

8.5.2.1 Manual (Tank) Method: dishwashing by hand can be done by the two-sink method or by the three-sink method. Both these systems start with the removal of leftover food, followed by a preliminary wash under running hot water, which helps to preserve the cleanliness. The dirt is removed from the utensils by scraping and then rinsing under the forced water stream.

- **Two - Sink Method**: The simplest and the most effective way of having germ-free cutlery and utensils is the two-sink method. Washing of utensils is done in the first sink that contains hot water at 110 – 115 degree Fahrenheit and suitable detergents. After removing and draining from the sink, the utensils are transferred to sink number two for rinsing and sterilizing.
- **Three - Sink Method**: After the dishes have been sorted out and the dirt has been removed, the utensils are washed in hot detergent solution in the first compartment, and then in second compartment at the temperature of water is 110 – 120 degree Fahrenheit. After the dishes are thoroughly clean they are sterilized in a third compartment.

  One method for sterilizing both dish and cooking utensils is by immersing them for at least two minutes in a lukewarm chlorine water. Dishes and utensils must be thoroughly cleaned in a chlorine rinse for an effective germicidal treatment. The desired temperature of water may be maintained by a thermostat-controlled heater arrangement.

8.5.2.2 Machine Method: The china having any debris is removed and then placed into either wooden or wire racks. The racks are then passed through the machine, the china being washed, rinsed, and then sterilized in turn. Having passed through the machine the china is left to drain for two to three minutes and is then stacked and placed on shelves.

This method saves a lot of time and labor ensuring that a good supply of cleaned sterilized crockery is available.

The **Dish Wash Machine** operates with a conveyor system for transporting the tableware through the machine on racks. In the pre-wash chamber, sprays of hot water re-circulated by the pump, remove most of the soil from the dishes. The soilage, mostly greasy in nature, floats to the top of the solution in the tank and is removed through an overflow pipe. When the rack on the conveyor reaches the wash stage, with detergent, the process is repeated. Here, all the soil and stains should be completely removed. The conveyor then passes through the pre-rinse stage, where sprays of hot water remove most, of not all, the washing solution.

In the final rinse, any remaining detergent is removed. The rinse water at this stage is hot enough (180-190 degree Centigrade) to act as a sanitizer, killing bacteria. A rinse additive is also injected into the final rinse water to provide a sheeting effect for quick drying and to prevent water spotting.

Dish washing machines are of various types i.e. Door-type, conveyor, flight-type and energy-saving type. A dish washing machine is a long-term investment. Managers should look at the machine in light of the operation's business volume forecasts and marketing plan.

Generally Cutlery is washed on the dishwasher along with other tableware, but first it is good practice to give a good pre-soak to silverware. Waiters should be trained to place cutlery directly from their cleaning trays into the container. Hollowware such as casseroles, sauceboats etc are handled the same ways as cutlery.

The dish washing machine's operational efficiency is based on five elements:

- Time
- Temperature
- Pressure
- Detergent
- Rinse additive

Time: Obviously, the longer a dish is exposed to wash and rinse sprays, the more certain it comes out clean. However, for maximum production, the highest feasible conveyor speed is desired commensurate with getting good results. The average time for a dish/basket to move the length of the cycle is approximately 2 ½ minutes. If production warrants a faster cycle, temperature can be increased with consistent results, but this will increase costs.

Temperature: Hot water is expensive, but cold water can cost more if the result is badly washed dishes and rejects. With every degree of added heat, the cleaning efficiency of a detergent solution is increased. Tank heaters may not be adequate to maintain temperatures at periods of peak production.

Pressure: The actual impact of the spray against the dish is a vital part of the cleaning process. Normally, the machine pump can produce the required pressure. However, the protein soils in the wash solution combine with detergent chemicals to cause foam, which strangles the water pump reducing its efficiency and leaving foam on the dish, making rinsing difficult. Scraping plates before processing through the machine helps prevent excessive foaming.

Detergent: Using the right detergent plays a vital part in achieving an efficient dish machine operation. The same detergent cannot be equally efficient or economical in soft water and in very hard water, or on lightly soiled dishes as on very dirty dishes.

Rinse Additive: There is no such thing as all-purpose rinse additive, and the selection should be made on the basis of a chemical analysis of the water supply and an inspection of operating conditions.

Types of Dishwashing machines:

- **Spray-type**: The dishes are placed in racks, which slide into the machines where they subjected to a spray of hot detergents and eater at 48-60 degree centigrade form above and below.

  The rack then moves on to the next section where they are rinsed by a fresh hot water shower of 80 degree centigrade. At this temperature they are sterilized and on passing out into the open they dry off quickly.

- **Brush - type**: Revolving brushes are used for the scrubbing of each article in hot detergent water. The articles used are then rinsed and sterilized in another compartment.

- **Agitator Water Machine**: Basket of dishes is immersed by the mechanical agitation of hot detergent water. The loaded basket is then given a sterilizing rinse in another compartment.

8.6 Liaison with Other Departments

The food and beverage production is one of the major non-revenue earning department in the hotel. For its effective functioning it depends on certain departments. Smooth coordination between these departments is quite important here. The kitchen staff must be fully aware of the task of each coordinating department.

8.6.1 Food and Beverage Service Outlets: These are the places, in which the food prepared by the kitchen is served. While large hotels have many food service outlets such as multi-cuisine restaurant, specialty restaurant, coffee shop, bar, night club, discotheque, room service and banquets etc., smaller hotels may have few outlets only like restaurant, room service and banquets.

A choice of food items range form salads, soups, cold meat platters, grilled and roasted meats to fish preparations to a variety of desserts are prepared in the kitchen and are sent to dining rooms for the service.

Various sections of kitchen that coordinate with Service department are;

- **Butchery**: Fish and meats are cut, carved, de-boned and filleted.
- **Garde Manger**: Salads, clod cuts, hors d'oeuvres are made.
- **Pantry**: It is the source for sandwiches, fruit platters, juices and shakes.
- **Grill**: Grilled items like steaks; fish chops etc are made here.
- **Vegetable Preparation**: Here all raw vegetables are cut into smaller presentable portions.
- **Bakery and Confectionery**: This section prepares bread rolls, croissants, cakes, pastries, muffins, cookies and ice creams etc.

In few large hotels, there may be separate special kitchens for room service and banquet or function catering departments.

8.6.3 Engineering: This department takes care of air-conditioning, lighting, plumbing and general maintenance. Communication is done through the maintenance work order book and remainders are used if required. This department also plays a vital role during renovations and repairs, which are done periodically. Good coordination with the department is vital for the upkeep of equipment and helps prevent untimely breakdown during service and costly repairs later.

8.6.4 Personnel Department: Staff recruitment and training are dealt by the personnel department in collusion with the Executive Chef. Any action to be taken regarding discipline will also be dealt with in the same way. This department is also in charge of staff cafeteria, lockers, etc. The Kitchen personnel get their leave applications processed and leave cards updated by personnel department. It also handles discrepancies in the time card.

8.6.5 Stores: It is the source from which the kitchen people get their supplies of vegetables, fruits, various meat items, proprietary sauces and any other supplies through corresponding indent books. Large hotels would have separate general stores, food stores, and perishable stores.

8.6.6 Accounts: It also deals with the payment of employee salaries.

8.6.7 Security: This discrete department handles the safety aspect of the organization. It is required to conduct safety and first aid drills & fire fighting exercises.

8.7 Conclusion

For the effective functioning and supervision, the production in kitchen is divided into many stations depend on its functions. Each station is designated various tasks to be performed on regular basis. All the sections are specialized in their own functions, so that high excellency is achieved in preparation of dishes.

The department must work in liaison with food service department. Both food production and service sectors are inter dependent and neither can function without the coordination of the other. It also coordinates with other departments of the establishment for the smooth and efficient running.

8.8 Self Assessment Questions

1. List and explain in detail, various sections of kitchen?
2. Briefly describe the departmental coordination with Food and Beverage Service, House Keeping departments?
3. Write a brief note on Kitchen Stewarding department?

8.9 References

1. Theory of Cookery by Krishna Arora
2. The Steward by Peter Dias

LESSON 9

Kitchen Equipment

9.0 Objectives

- To introduce and discuss various equipments used in kitchen
- To explain the maintenance and cleaning procedures followed for various equipment

Contents

9.1 Introduction

Kitchen Equipment is expensive and to justify the expense it is essential that maximum use be made of it. This can be done only if the equipment being used works efficiently and in turn this depends on the care and maintenance of the equipment. The routine use, care and cleaning of all items of equipment are important and this should be understood. When selecting equipment, capacity, trade name, good quality, simple design and ease to clean should be considered.

9.2 Points to be considered while Purchasing Kitchen Equipment

General points that must be considered when purchasing equipment for a kitchen are;

- The layout of kitchen area
- Type of dishes to be cooked
- Capacity
- Durability
- Availability of future replacements
- Flexibility
- Design
- Color
- Storage
- Rate of breakage

- Ease of maintenance
- Cost
- Funds available
- Brand name

9.3 Classification of Kitchen Equipment

In general, kitchen equipment may be divided into three categories:

- Large Equipment: Ranges, steamers, boiling pans, fryers, sinks, and tables.
- Mechanical Equipment: Peelers, mincers, mixers, refrigerators, dishwashers.
- Utensils, and small equipments: Pots, pans, whisks, bowls, spoons, plate knives, graters etc.

Large Equipment

9.3.1 Stoves/ Range: The range is still the most important piece of cooking equipment in the kitchen, even though many of its functions have been taken over by other tools, such as steamers, steam kettles, tilting pans, and ovens.

Variety of stoves available in the market, which are fired by gas, electricity, solid fuel or oil. The stoves cooking tops range form open elements (cook top space is limited to one pot per burner), flat top to heavy-duty flat top (top is covered with heavy cast steel, that can support many heavy pots)

Cleaning and Maintenance:

- Solid tops should be washed clean, or wiped clean with a cleaning pad.
- After cooling down, the stove can be thoroughly cleaned by washing and using an abrasive such as emery-paper.
- After cleaning, the slid top should always be lightly greased.
- All the gas jets should be lit and checked that none are blocked.
- All enamel parts of the stove should be cleaned while warm with hot detergent water, rinsed and dried.

9.3.2 Ovens: ovens are enclosed spaces in which food is heated, usually by hot air or, in some newer kinds of ovens, by microwaves or infrared radiation. In addition to the roasting and baking, ovens can do many jobs normally done on the rangetop. Many foods can be simmered, stewed, braised, or poached in the oven, freeing the rangetop and the chef's attention for other tasks.

The varieties of ovens used in hotels range from conventional, convection, revolving, slow-cook-and-hold, microwave ovens.

Maintenance of Ovens: All electric models are fitted with an on-off switch, which operates the entire oven. These will be linked to an indicator light in some models, which lights up when the oven is switched on.

On gas oven, an on/off switch will also be fitted to operate the electrically driven fan, the interior light and ignition system if fitted.

Operational instructions:

- Switch on oven, set the temperature once it reaches desired temperature.
- Always load the lower compartment first.
- Always load each shelf evenly, spacing pan, trays away from each other and the side of the oven.
- Never add material to a section after foods already have started to bake- unbalanced baking will result.
- Open doors as seldom as possible.

Cleaning of Ovens:

- The insides of ovens and oven racks should be cleaned while slightly warm, using detergent water and a mild abrasive.
- If the dirt or grease is too much in the oven, then caustic soda can be used, but thorough cleaning and rinsing has to be done afterwards.
- Oven doors should not be slammed as this may cause damage.
- Unnecessary lighting or lighting the ovens too early can cause wastage of fuel, which is nothing but wastage of money.

9.3.3 Broilers and Salamanders: Broilers generate heat from above, and food items are placed on a grate beneath the heat source. Broiling is a favorite way of preparing steaks, chops, chicken and many other items.

Heavy-duty boilers produce very high heat and consume vast quantities of energy. Some broilers are said to go as high as 1100°C at the burner. Foods must be watched closely to avoid burning. Cooking temperature is adjusted by raising or lowering the grate that holds the food.

Salamanders are usually small broilers used primarily for browning or glazing the tops of some items. They may also be used for broiling small quantities during off-peak hours.

9.3.4 Grills: Grills are used for the same cooking operations as broilers except the heat source is below the grid that hold the food rather than above it. Many people like grilled foods because of their charcoal taste, which is created by smoke from meat fats that drip into the heat source.

Many grill models are in use. The major differences in operation among them are due to the difference in heat source – gas, electricity, or charcoal.

Maintenance of Grillers:

- Wipe griller- hot plate with damp duster.
- Put on the switch, once it becomes hot, put pre-prepared items on it and cook.

Cleaning of Grillers:

- Cast iron grill plates may occasionally need scraping.

- After every season, it is best to wash the plate with a mild detergent solution, rinse and dry.

9.3.5 Griddles: Griddles are solid metal plates heated from below. They are used for cooking individual portions of meat, eggs, bacons, pancakes, French toast, hamburgers, and potato items are the foods most frequently. They can be heated to a high temperature and are suitable for rapid and continuous cooking. When cooking is commenced, a light film of oil should be applied to the food and the griddle plate. Griddles are available as separate units or as part of rangetops.

Cleaning of griddles:

Clean griddle surfaces after every use so that they will cook at peak efficiency. Polish with a griddle stone or griddle cloth until the surface shines. Follow the grain of the metal to void scratching.

9.3.6 Deep – fryers: A deep fryer has only one use – to cook foods in hot fat. Yet because of the popularity of the fried foods, this function is an important one.

- Standard deep fryers are powered by either gas or electricity and have thermostatic controls that maintain fat at preset temperature.
- Automatic fryers remove food form the fat automatically after a preset time.
- Pressure fryers are covered fry kettles that fry foods under pressure. Foods cook faster, even at a low temperature.

Maintenance of Deep Fat Fryer:

- Clean and wipe deep fat fryer.
- Pour oil/fat in containers, put on main switch; turn temperature control knob, press operating switch.
- Once oil reaches desired temperature, add frying food to the fryer.
- When breaded foods are prepared, strain fat frequently.
- Load fry basket to half and never more than 2/3 of capacity.
- Never salt foods directly over the fat. Salt in the fat reduces its life.
- Discard fat as soon as it tends to bubble excessively before food is added as a gummy film collects on the frying basket or heating element.

Cleaning of Deep Fat Fryer:

- Switch off the fryer and allow cooling. Drain all the oil in normal way.
- Drain all debris and particle matter from the fryer.
- Fill the fryer compartment with soap solution.
- Brush inside using a bristle brush (never use steel wool).
- Flush with clean water to which vinegar has been added. Dry with cloth.

9.3.7 Tilting Skillet: The tilting skillet, also known as the tilting brazier and tilting fry pan, is a versatile and efficient piece of equipment. It can be used as a griddle, fry pan, brazier, stew pot, stock pot, steamer, and bain-marie or stem table.

Once the food is cooked, tilt the pan and remove the food in a deep tray.

Maintenance of Tilting Pan:

- Ensure that the pan is tightly fitted by moving handle of the pan.
- Switch on the main, then switch on operating switch, turn temperature control on high.
- Press ignition switch for 20 seconds. Put fat or oil and then use according to the preparation.

Cleaning of Tilting Pan:

- The equipment should be cleaned thoroughly after use. Normally washing with hot soapy water and rinsing with clean will be sufficient.
- Wire scourers or scouring powders are not recommended for models with an all stainless steel finish.
- If the pan has been used for frying, care should be taken to remove all oil film build up.
- The tilting mechanism may require occasional greasing with light non-toxic oil.

9.3.8 Steam Cookers: Steam cookers are ideal for cooking vegetables and many other foods rapidly and with minimum loss of nutrients and flavor. For this reason, they are becoming more common in both large and small kitchens.

Pressure steamers cook foods under a pressure of 15 pounds per square inch (high-pressure steamers) or 4 to 6 pounds per square inch (low-pressure steamers). They are operated by a timer, which shuts the equipment off after a preset time. The door can not be opened until the pressure returns to zero.

Cleaning and Maintenance of Steamers:

- Steaming ovens that work from a main steam supply need little maintenance.
- The door controls should be greased occasionally.
- Steamer trays and runner should be washed in hot detergent water.
- The pressure gauges and warming whistle which registers steam pressure (½ lb per square inch) should be checked by a qualified engineer.
- Constant supply of water should always be there in the generating tank.
- Steamer trays and the insides of the steamer should be cleaned with detergent water and rinsed.

9.3.9 Steam-Jacket Kettle / Boling Pans:

- Many types are available in different metals and various sizes (10, 15, 20 and 40 liters or more capacity).
- They may be heated by gas, electricity or steam from the main supply. They are basically used for large quantities of food.
- In order to take care that food doesn't get burned, steam jacket type (double walled) boilers are more suitable.
- These boilers are normally fitted with a tilting device to facilitate emptying of the contents.
- After use, the pan and the lid should be thoroughly washed with a mild detergent solution and then rinsed well. all moving parts should be greased occasionally and checked to see that they are in good condition.
- If gas fired, gas jets and pilot should be inspected to ensure correct working.

- If a pressure gauge and safety valve are fitted, they should be checked whether they are working correctly.

9.3.10 Dough Mixer: This is an important labor-saving, electrically operated piece of equipment which mixes the bread dough well. While small quantities of dough can be mixed by hand, commercial bakery in any quantity would be next to impossible without power mixers. Several types of mixers used in dough and pastry making are Vertical, Spiral and Horizontal Mixers.

Maintenance of Dough Mixer:

- Wash bowl and dough kneading rod, or creamer or whisk.
- Fix bowl on mixer, then attach rod or creamer as per requirement.
- Put ingredients in the bowl, lift up the bowl by turning handle anti-clockwise.
- Press green switch; increase speed by turning gear handle clock-wise.
- After use, reduce speed, press red switch, lift down the bowl by turning handle clock-wise. Remove mixing rod and then remove the finished product.

Cleaning of Dough Mixer:

- Put off main switch of the dough mixer.
- Wash all the attachments.
- Check belt of the motor occasionally.

9.3.11 Tandoor: The tandoor should be coated with a mixture of ash, earth and water. The inside of the tandoor should be seasoned with mustard and oil. The latest is that gas tandoor is being used widely in the west as it is cleaner and has continuous heat.

Maintenance of Tandoor:

- Put charcoal in tandoor; separately light some coal on gas burner. Pour live coal in tandoor.
- Keep the ash-hole half open.

9.3.12 Bain-Marie: A bain-marie is a hot water bath. Containers of foods are set on a rack in a shallow container of water, which is heated by electricity, gas, or steam. The bain-marie is used more in the production area, while the steam table is used in the service area.

9.3.13 Food Slicer: Food slicers available are both manually and electrically operated. They are labor-saving devices which can be dangerous if not operated with care. Because of this, the working instructions should be placed in a prominent position near the machine.

Maintenance of Food Slicer:

- Care should be taken that no material likely to damage the n\blades is included in the food to be sliced. If a piece of bone comes into contact with the cutting blade, severe damage will result.
- The blades should be sharpened regularly.
- Each section that comes into contact with food, should be cleaned carefully and dried after use.
- Moving parts should be lubricated, but oil must not be allowed to come into contact with ant food.

- Extra care must be taken when blades are exposed.

9.3.14 Potato Peelers: This is an important labor-saving, electrically operated piece of equipment which peels the potatoes with a greater speed.

- Wash peeler from inside; tightly close the door.
- Put potatoes from top. Start main switch as well as water supply.
- After peeling, open door of the peeler let all the peeled potatoes come out of the peeler. Switch off the main.

Cleaning of Potato Peelers:

- Detach upper desk of the peeler, wash it thoroughly with scrubber, rinse and wipe it dry.
- Remove all the potato peels from it. Scrub thoroughly with scrubber, wash and dry completely.
- Fix upper deck and check for its function.

9.3.15 Pots and Pans and their Uses:

- **Stockpot**: A large, deep, straight-sided pot for preparing stocks and simmering large quantities of liquids. Stockpots with spigots allow liquid to be drained off without disturbing the solid contents or lifting the pot.
- **Saucepot**: It is a round pot of medium depth. It is similar to a stockpot but shallower, making stirring or mixing easier. Used for the preparation of soups, sauces, and other liquid foods.
- **Brazier**: Round, broad, shallow, heavy-duty pot with straight sides. Used for browning, braising, and stewing meats.
- **Saucepan**: It is similar to small, shallow, light sauce pot, but with one long handle instead of two loop handles. May have straight slanted sides. Used for general range top cooking.
- **Sautépan**: It is also called fry pan and is used for general sautéing and frying of meats, fish, vegetables and eggs. The sloping sides allow the cook to toss items without using spatula, and they make it easier to get at the food when a spatula is used.
- **Double boiler**: It has a lower section, which is similar to a stockpot, holds boiling water. The upper section holds foods that must be cooked at low temperatures and cannot be cooked over direct heat.
- **Bake pan**: A rectangular pan about 2 inches deep and is used for general baking. It comes in variety of sizes.
- **Roasting pan**: A large rectangular pan, deeper and heavier than bake pan. It is used over roasting meats and poultry.
- **Baba mould**: A small timbale-shaped mould for making babas
- **Barquettes**: A small boat-shaped mould for petits fours and small tartlets
- **Loaf pan**: A rectangular pan, usually with slightly flared sides, used for baking loaf breads. Loaf pans can also be used for moulding refrigerated and frozen desserts.
- **Muffin pan**: Metal baking pan with cup shape indentations for baking muffins.

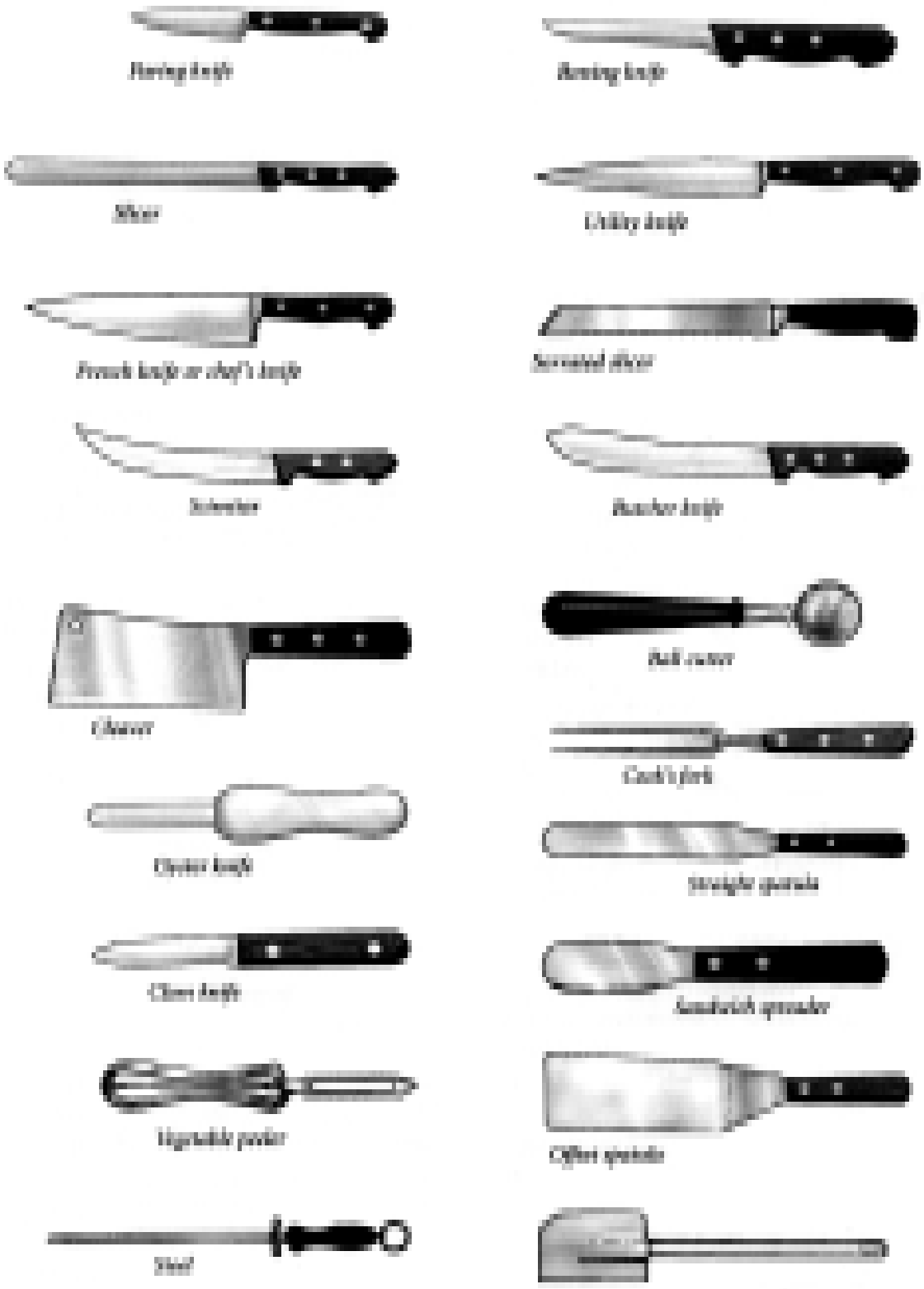
- **Savarin mould**: Small ring-shaped or dough-nut shaped metal moulds for baking savarins.

9.3.16 Measuring Devices:

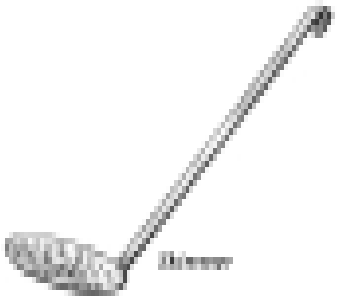
1. **Scales**: Most recipe ingredients are measured by weight, so accurate scales are very important. Portion scales are used for measuring ingredients as well as for portioning products for service.
2. **Volume measurers**: These are used for liquids, have lips for easy pouring.
3. **Thermometers**: These are used to measure temperatures. They are many kinds of thermometers used for many purposes.
    - A Meat Thermometer indicates internal temperature of meats. It is inserted before cooking and left in the product during cooking.
    - An Instant-read Thermometer gives readings within a few seconds of being inserted in a food product. It reads from 0° to 220°F. instant thermometers must not be left in meats during roasting or they will be damaged..
    - Fat thermometers and Candy thermometers test temperatures of frying fats and sugar syrups. They read up to 400°F
    - Special thermometers are used to test the accuracy of the oven, refrigerator, and freezers.

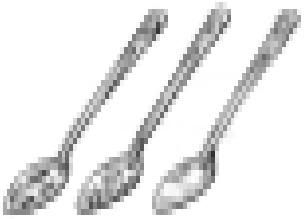
9.3.17 Knives and their Uses:

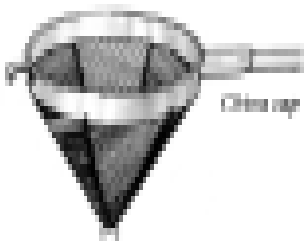
- **French Knife or Chef's Knife**: this is the most frequently used knife in the kitchen, for general propose chopping, slicing, dicing, and so on. Blade is wide at the heel and tapers to a point. Blade length of 10 inches is most popular for general work. Larger knives are heavy cutting and chopping. Smaller blades are more delicate work.
- **Utility Knife or Salad Knife**: This is a narrow pointed knife of 6 to 8 inches long. Used mostly for pantry work, cutting and peppering lettuce, fruits and so on. It is also useful for carving roast chicken duck.
- **Paring Knife**: A small pointed blade of 2 to 4 inches long, mostly used for trimming and paring of vegetables and fruits.
- **Boning knife**: This is thin, pointed bade of about 6 inches long. It is used for boning raw meats and poultry. Stiff blades are used for heavier work. Flexible blades are used for lighter work and filleting of fish.
- **Slicer**: This is long, slender, flexible blade up to 14 inches long. It is used for carving and slicing cooked items.
- **Serrated Slicer**: It is like a slicer, but with serrated edges. It is used over cutting breads, cakes and similar items
- **Butcher knife**: It is heavy, broad, slightly carved blade and is used for cutting, sectioning and trimming raw meats in the butcher shop.
- **Scimitar or Steak Knife**: It has a curved, pointed blade and is used for accurate cutting of steaks.
- **Cleaver**: it is very heavy, broad blade and is used for cutting through bones.

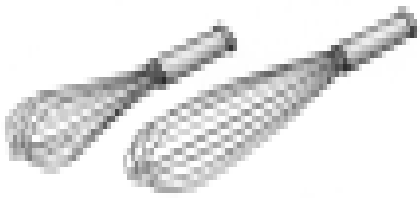


Rubber Spatula









- **Vegetable peeler**: It is a short tool with a slotted, swiveling blade and is mainly used for peeling vegetables and fruits.

9.3.18 Hand tools and small equipment:

- **Ball cutter or melon ball scoop**: The blade is small, cup-shaped half-sphere. It is used for cutting vegetables and fruits into small balls.
- **Straight spatula or Palette Knife**: It is a long, flexible blade with a round end tool. This is used for spreading icing on cakes and for mixing and bowl scraping.
- **Sandwich spreader**: It I a short, stubby spatula and is used for spreading fillings and spreads on sandwiches.
- **Cook's fork**: A heavy, two-pronged fork with a long handle tool and is used for turning meats and other items. It must be strong enough to hold heavy loads.
- **Bench scraper or dough knife**: It is a broad, stiff piece of metal with a wooden handle on one edge. It is used to cut pieces of dough and to scrape workbenches.
- **Pastry wheel or Wheel knife**: This is a round, rotating blade on a handle and is used for cutting rolled-out doughs and pastry and baked pizza.
- **Tongs**: These are spring type or scissors-type tools, used to pickup and handle foods.
- **Wire whip**: Loops of stainless-steel wire fastened to a handle. There are two kinds of whips:
    1. **Heavy whips** are straight, stiff, and have relatively few wires. Used for general maxing, stirring, and beating, especially heavy liquids.
    2. **Balloon whips or piano-wire whips** have many flexible wires. Used for whipping eggs, cream, and hollandaise, and for maxing thinner liquids.
- **China cap**: Cone-shaped strainer. Used for straining stocks, soups, sauces, and other liquids. Pointed shape allows the cook to drain liquids through a relatively small opening.
- **Fine china cap or chinois (shee-nwah):** China cap with very fine mesh. Used when great clarity or smoothness is required in a liquid.
- **Strainer**: Round-bottomed, cup-shaped strainer made of screen-type mesh or perforated metal. Used for straining pasta, vegetables, and so on.
- **Sieve**: Screen-type mesh supported in a round metal frame. Used for sifting flour and other dry ingredients.
- **Colander**: Large perforated bowl made of stainless steel or aluminum. Used to drain washed or cooked vegetables, salad greens, pasta, and other foods.
- **Food mill**: A tool with a hand-turned blade that forces foods through a perforated disk. Interchangeable disks have different coarseness or fineness. Used for pureeing foods.
- **Grater:** A four-sided metal box with grids of varying sizes. Used for shredding and grating vegetables, cheese, citrus rinds, and other foods.
- **Zester**: Small hand tool used for removing the colored part of citrus peels in thin strips.

- **Channel knife**: Small hand tool used mostly in decorative work.
- **Pastry bag and tubes**: Cone-shaped cloth or plastic bag with open end that can be fitted with metal tubes or tips of various shapes and sizes. Used for shaping and decorating with items such as cake icing, whipped cream, duchesse potatoes, and soft dough.
- **Pastry brush**: Used to brush items with egg wash, glaze, etc.
- **Can opener**: Heavy duty can openers are mounted on the edge of the workbench. They must be carefully cleaned and sanitized every day to prevent contamination of foods. Replace worn blades, which can leave mental shavings in the foods.
- **Skimmer**: it is a perforated disk, slightly cupped, on a long handle. It is used for skimming froth from liquids and for removing solid pieces from soups, stocks and other liquids.
- **Pastry bag**: A cone-shaped cloth or plastic bag with an open end that can be fitted with metal or plastic tubes or tips of various shapes and sizes. Used for shaping and decorating with items such as icing and filling certain kinds of pastries and other items, such as éclairs, and for portioning creams, fillings, and doughs.
- **Roller docker**: A tool that pierces holes in rolled-out dough to prevent during baking. It consists of a handle attached to a rotating tube fitted with rows of spikes.
- **Rolling pins**: Many types of rolling pins are used in the bakeshop for rolling out doughs. Perhaps the most versatile pin, used for most general rolling tasks, is simply a solid hardwood rod, about 2 inches (5 cm) thick and 20 inches (50cm) long.
- **Turntable**: A round, flat disk that swivels freely on a pedestal base. It is used for rolling cakes while decorating.
- **Scrapers**: A bench scraper, also called dough scraper, is a small rectangle of stainless steel with a handle along one of the long edges. It is used for cutting and portioning dough and for scraping purposes. A bowl scraper is a plastic about the same size but with one curved edge and no handle. It is used for scraping out the contents of mixing bowls.

9.4 Conclusion

Through of kitchen equipment is essential for success in the kitchen. Few food service establishments depend on nothing more than a range and an oven, an assortment of pans, knives and other hand tools. Modern technology continues to develop more and more specialized and technically advanced tools to reduce kitchen labor.

Much of this equipment is so complex or so sophisticated that only firsthand instruction and practice will teach you how to operate it effectively and safely. Other items, specially hand tools, are simple and need no explanation but require much practice to develop good manual skills.

A vast array of specialized equipment is available for today's kitchens ranging from crepe machines, pasta machines to doughnut glazers. In this technological age, every year brings new tools to simplify various tasks. Hence, a culinarian must regularly update his knowledge about the new equipments available in the market and their operational procedures.

9.5 Self Assessment Questions

1. What are the criteria to be considered while purchasing kitchen equipment?
2. Explain briefly, the different types of equipment used in kitchen with maintenance and cleaning procedures?
3. List and explain five equipments used in bakery?
4. Give short notes on various types of knives used in kitchen?
5. Write a brief notes on different hand tools and small equipment used in kitchen?

9.6 References

1. Theory of Cookery by Krishna Arora

Professional Cooking 5th edition by Wayne Gisslen

LESSON 10

Kitchen Safety

10.0 Objectives

- To identify the safe work place habits that minimizes the likelihood pf fires and falls
- To explain the preventive measures that can be followed to avoid cuts, burns and etc.

Contents

10.1 Introduction

Kitchen work is usually considered a relatively safe occupation, at least in comparison with many industrial jobs. Nevertheless, the kitchen has many hazards. Minor injuries from cuts and burns are very common, and more serious injuries are all too possible. The quantity of very hot equipment and powerful machinery, combined with the busy, sometimes frantic pace, make it important for everyone to work carefully and with constant attention to rules of safety.

Staff (employees, cooks and cleaners) working in the food production area should be made aware of what is what and trained properly to meet any emergencies immediately so that they can react properly in case of any accidents rather than waiting for somebody to come. Staff must be made aware of the importance of working in a safe environment.

Maintenance a safe and secure working environment: The 1974 Health and Safety at work Act was passed to protect employees and employers to increase their awareness of the need for safety at work. The employer's responsibilities are to:

a) Provide and maintain premises and equipment that are safe and without risk to health.

b) Provide supervision, information and trainings.

c) Issue written statements on general, policy and procedures regarding health and safety.

d) Consult with employee's safety representative and to establish a safety committee.

Employees are responsible to take reasonable care to avoid injury to themselves or others, to co-operate with employers so as to comply with law and not to misuse anything provided for health and safety.

10.2 The safe work place

The management of the food service operation must see to it that the structure and equipment have necessary safety features.

- Structure, equipment, and electric wiring in good repair
- Adequate lighting on work surfaces and in corridors
- Non slip floors
- Clearly marked exits
- Equipment supplied with necessary safety devices
- Heat-activated fire extinguishers over cooking equipment, especially deep-fryers
- Clearly posted emergency telephone numbers
- Smooth traffic patterns to avoid collisions between workers
- Conveniently located emergency equipment, such as fire extinguishers, fire blankets, and first-aid kits

10.3 Prevention of Cuts

- Keep knives sharp. A sharp knife is safer than a dull one because it requires less pressure and is less likely to slip.
- Use a cutting board. Do not cut against a metal surface. Place a damp towel, under the board to keep it from slipping.
- Pay attention to your work when using a knife or cutting equipment.
- Cut away from yourself and other fellow workers.
- Use knives only for cutting, not for such jobs as opening bottles.
- Don't try to catch a falling knife. Step back and let it fall.
- Don't put knives in a sink, under water, or any place where they can't be seen.
- Clean knives carefully, with sharp edges away from you,
- Store knives in a safe place, such as in a rack, when not in use
- Carry knives properly. Hold the knife beside you, point down, with the sharp edge back and away from you. Don't swing your arm. Whenever possible carry knives in a sheath. Warn people when you are walking past them with a knife in hand.

- Keep breakable items, such as dishes and glassware, out of the food preparation area.
- Don't put the potable items in the pot sink.
- Sweep up, don't pick up, broken glass.
- Discard chipped or cracked dishes and glasses.
- Use special containers for broken dishes and glasses. Don't throw them in with other garbage.
- If there is broken glass in the sink, drain the sink before trying to take out of the glass.
- Remove all nails and staples when opening crates and carton, and dispose of them.

10.4 Prevention of Burns

- Always assume a pot handle is hot. Don't just grab it wit your hand.
- Put some white thing, e.g. flour on handle and lid to indicate that it is hot.
- Use dry pads or towels to handle hot pans. Wet ones will create sream, which can burn you.
- Keep pan handles out of the aisle so people won't bump into them. Also, kep handles away from open flames of gas burners.
- Don't fill pans so full that they are likely to spill hot foods.
- Get help when moving heavy containers of hot food.
- Open lids away from you to let steam escape easily.
- Use care when opening compartment steamers.
- Make sure gas is well vented before trying to light ovens or pilot lights. Strike matches before turning on the gas. Also, strike matches away from yourself.
- Wear long sleeves, and a double –breasted jacket to protect yourself from spilled or spattered hot foods or fat. Also, wear sturdy leather shoes with closed toes.
- Dry foods before putting them in frying fat, or hot fat may splatter on you.
- When placing foods in hot fat, let them fall away from you so that fat will not splash on you.
- Keep liquids away from the deep fryer. If a liquid were spilled into the fryer, the suddenly created steam could spray hot fat on anyone nearby.
- Always warn people when you are walking behind them with hot pans or when you are walking behind someone who is working with hot items.
- Warn service people about hot plates.
- Trays containing, hot liquid should be handled carefully. (put one hand on one side and the other one on the other hand).
- When pouring boiling liquid keep your face away as far as possible.

10.5 Prevention of injuries from machines and equipment

- Do not use any equipment unless you understand its operation.
- See that the machine is in correct running before and after use.
- Use a particular machine for the particular type of job.
- Use all guards and safety devices on equipment. Set slicing machines at zero (blade closed) when not in use.
- Don't touch or remove food from any kind of equipment while it is running, not even with a spoon or spatula.
- Unplug electrical equipment before disassembling or cleaning.
- Make sure the switch is off before plugging in equipment.
- Do not touch or handle electric equipment, including switches, if your hands are wet or if you are standing in water.
- Wear properly fitting clothing and tuck in apron strings to avoid getting them caught in machinery.
- Use equipment only for the purpose intended.
- Stack pots and other equipment properly on pot racks so that they are stable and not likely to fall.
- There should be proper earth connection of the electrical machines.

10.6 Prevention of falls

- Clean up spills immediately.
- Throw salt on a slippery spot to make it less slippery while a mop is being fetched.
- Keep aisles an stairs clear and unobstructed.
- Don't carry objects too big to see over.
- Walk, don't run.
- Use a safe ladder, not chairs or piles of boxes, to reach high shelves or to clean high equipment.

10.7 Prevention of strains and injuries from lifting

- Left with leg muscles, not the back
- Don't turn or twist the back while lifting, and make sure your footing is secure.
- Use a cart to move heavy objects long distances, or get help.

10.8 Fire Safety

Fires in hotel and catering establishments are common and all too can often result in injury to the employee and in serious cases either injure or loss of life to employees and customers.

A basic knowledge regarding fire should assist in preventing fires and handling them if they do occur. Three components are necessary for a fire to start, if one of the three is not present, or is removed, then the fire does not happen or it is extinguished. The three parts are;

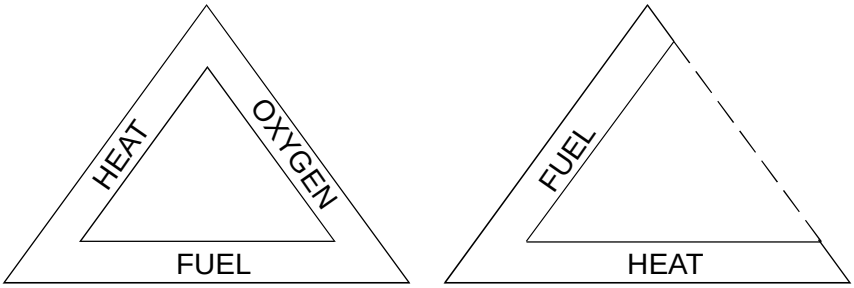
- Fuel – something to burn
- Air – oxygen to sustain combustion (to keep the fire going)
- Heat – gas, electricity, etc.

10.8.1 Types of Fires: Fires are graded into different categories

- Class A Fires : These fires are normally such as of wood, paper, cotton rags
- Class B Fires : These are of oil, kerosene, paints etc.
- Class C Fires : These are caused by electricity.

10.8.2 Methods of Extinguishing a Fire: To extinguish a fire, the three principal methods are:

- Starving – removing the fuel.
- Smothering – removing the air (oxygen)
- Cooling – removing the heat



THE FIRE TRIANGLE

The fuel is that which burns, heat is that which sets the fuel alight and oxygen is needed for fire to burn. Eliminate one of the these will put the fire off. Oxygen is present in the air, so if air is excluded from the fuel and the heat then the fire goes out. For example, should the cloths of someone working I the kitchen catch the fire ten the action to be taken is to quickly wrap a fire blanket round the person and roll them on the floor. In doing so, the flames have been cut off from the source of air. (The oxygen has been taken away from the triangle). In the vent of fire, windows and odors are to be closed so as to restrict the amount of air getting to the fire. Foam extinguishers work on the principle that the foam forms a 'blanket' thus excluding air from coming into contact with the fuel.

If fat or oil in a pan ignite, then the pan should be quickly covered with a lid or other item or fire blanket so as to exclude air. It is also essential to turn off the source of heat, gas or electricity, etc. so that the heat is taken away from the triangle.

Water extinguishers by dousing the flames thus taking the heat out of the triangle provided the fuel is material such as wood, paper etc. If fat or oil is alight, water must not be used as it causes the ignited fat to spread thus increasing the heat. Water extinguishers must not be used on live electrical equipment because water is a conductor of heat.

In the event of small fire in a store, it may be possible to remove items in the store to prevent fire from spreading. Fire doors are installed for the purpose of restricting an area so that, the fuel is limited.

10.8.3 Fire Extinguishers

All fire extinguishers should have been manufactured in accordance wit ISI specifications; they should be red with an additional color code to indicate the type and with operating instructions on them.

Foam (Cream color): Foam puts out fires by forming a blanket of foam over the top of fire. It is particularly good for putting out fat fires because the foam stays in position and so stops the fire-reigniting. Foam can also be used on fires of natural materials. This extinguisher should not be used on class C fires.

Carbon dioxide (Black Color): carbon dioxide gas is used on fires of inflammable liquids and has the advantage that it does not conduct electricity.

Dry powder (Blue color): Dry powder is commonly used for fat fires. It does not conduct electricity, and some all-purpose powders can be used on fires in natural materials. Powders based on bicarbonate of soda are used in most extinguishers.

Fire-hoses: Fire-hoses are used for similar fires to those classified under water fire extinguishers. It is necessary to be familiar with the instructions displayed by the fire-hose before using it.

Water Sprinkler systems: These consist of sprinklers from the main water supply fitted in the ceiling. The system is designed to automatically spray water over the whole area when the temperature rises above a pre-set level, e.g. 167°F

Each extinguisher should be fixed on a suitable bracket, be properly maintained and should be always available for use. It should be immediately refilled after use. It is important that the staff must be trained how to use them.

Research and development by the manufacturers of fire-fighting equipment inevitably leads to changes and increased efficiency in the various appliances as it is important that the best fire extinguishers are always available. Always consult the fire prevention branch of the fire brigade if necessary

10.8.4 Procedure in the Event of Fire:

- Do not panic
- Warn other people in the vicinity
- Do not jeopardize your own safety or that of others.
- Follow the fire instructions of the establishment
- If it is a small fire, use appropriate fire extinguisher.
- Do close doors and windows, turn off gas, electricity and fans.
- Do not wait for the fire to get out of control, before calling the fire brigade.

It is important that in all catering establishments, passageways are kept clear and that doors open outwards. Fire-escape doors and windows should be clearly marked and fire-fighting equipment

must be retake available and in working order. Periodic fire drills should occur and be taken seriously since lives may be endangered if there is a fire. Fire-alarm bells must be tested at least four times a year and the staff should be instructed in the use of fire-fighting equipment.

10.8.5 Fire Prevention Measures:

The best method of fire prevention in the positive of constructing the building so far as possible in incombustible materials and in such a way that a fire starting in the contents of any compartment of the building can be isolated and confined to that one compartment. The following points require due consideration

- There should be an adequate supply of ash trays and means of disposing cigarettes ends. Smoking should be prohibited in the areas of high risk.
- Rubbish must be cleaned regularly.
- Chimneys should be cleaned regularly.
- The air conditioning plants, boilers, electric wiring in appliances and other similar equipment should be correctly operated and maintained.
- All employees must be familiar with various safety measures to ensure that fire does not break out.

10.9 Conclusion

The basic knowledge needed for proficient performance in the kitchen is not limited to that of knife usage or the kitchen language, but is extended to the sanitation and kitchen safety. The information presented here is the foundation upon which the culinarian or organization will continue to build his/ its own procedures to avoid kitchen hazards.

Poor kitchen safety results in injuries, medical bills and workdays lost. Finally poor sanitation and kitchen safety habits leads to unhappy customers, and so the service establishment is in a situation of jeopardize economically

10.10 Self Assessment Questions

1. Write a brief notes on preventive procedures than can be taken to avoid cuts and burns?
2. What are preventive steps that can be taken to avoid injuries from machines and equipment and falls?
3. Give a brief notes on fire safety?

10.11References

1. Professional Cooking 5th edition by Wayne Gisslen
2. Theory of Cookery by Krishna Arora

LESSON 11

Vegetables and Fruits

11.0 Objectives

- To introduce vegetables and fruits as primary ingredients in kitchen
- To introduce various groups of vegetables used in kitchen
- To discuss the selection criteria of fruits and vegetables
- To explain the storage and handling procedures of fruits and vegetables
- To explain the role of fruits and vegetables in cookery

Contents

11.1 Introduction to Vegetables

Vegetables are plants or parts of plants that are used as food. The term vegetable has through usage come to apply in a more narrow sense to those plants or parts of plants that are served raw or cooked as a part of the main course of a meal.

Vegetables supply many nutrients besides providing variety to the diet. They make the food attractive by their colour, texture and flavour.

Various parts of plants are used as food and the botanical classification of such parts is important because it furnishes some clue to the structure and composition which in turn may influence the use of vegetables in the raw state and the method or time of cooking. Various parts of plants vary in their water, protein, vitamin, mineral and carbohydrate contents.

11.2 Classification of Vegetables

Vegetables are classified according to the parts of the plant consumed or colour of the vegetable or according to the nutritive values.

Group	Examples
Roots	Carrot, beet root, radish, turnip, colocasia
Tubers	Potatoes, Sweet potatoes, tapioca
Bulb	Onion, garlic, leeks
Leaves	Cabbage, lettuce, spinach, amaranth, fenugreek leaves, Coriander leaves, mint leaves.
Flowers	Plantain flower, cauliflower, neem flower, broccoli.
Fruits	Tomatoes, brinjal, lady's finger, pumpkin, cucumber gourds (ash gourd, bottle gourd, ridge gourd), capsicum, drumstick, Plantain.
Legumes (pods and seeds)	Peas, beans, chowli, broad beans, French beans, double Beans, Bengal gram tender, red gram tender.
Stems	Plantain stem, ginger, amaranth stem, celery stem.
Seed sprouts	Green gram, Bengal gram, soya bean sprouts
Fungi	Mushrooms
Algae	Spirulina

11.3 Composition and Nutritive Value of Vegetables

Vegetables differ in their chemical composition. They are called protective foods as they are rich in minerals and vitamins. Nutritionally they are classified into 3 groups.

- Green leafy vegetables.
- Roots and tubers
- Other vegetables

Nutritive Value of Green Leafy Vegetables

Leaves are the manufacturing organs of a plant where the life giving process of photosynthesis takes place. In the cells, photosynthesis transforms elements into carbohydrates which are carried to others parts of the plant. The leaves in consequence are low in carbohydrates and energy but they are good sources of B-carotene, calcium, riboflavin, folic acid, ascorbic acid, iron and vitamin K.

Generally green leaves are not good source of protein. Agathi and drumstick leaves are exception containing a high content of protein. Beet greens are excellent source of iron and riboflavin. Though green leafy vegetables are fairly good sources of calcium and iron, all may not be available to the body due to the presence of oxalic acid and fibre.

Generally all the greens are source of B-carotene particularly coriander leaves. Dark green leafy vegetables have more carotenes than light ones, that is, outer layers of cabbage gives more carotene than the inner leaves.

Drumstick leaves are the inexpensive greens and they are rich in fiber and calcium. Green leafy vegetables are good source of folic acid. Green leafy vegetables contain high amount of moisture. Hence they are not good source of calories.

Nutritive Value of Roots and Tubers

- Roots and tubers give more calories compared to green leafy vegetables because they contain more starches.
- Carrots contain high amount of carotene though this is lower when compared to the content present in green leafy vegetables.
- Roots and tubers are fairly good source of vitamin C.
- They are poor source of calcium, iron and B-vitamins.
- They are poor source of protein.

Nutritive Value of Other Vegetables

- They contain high amount of moisture and hence they are highly perishable
- They are generally poor in all nutrients.
- They are fairly good source of vitamin C
- They contribute to the fibre content of the diet.
- Plantain green contains high amount of iron.
- Capsicum contains vitamin C.
- Small bitter gourd is more nutritious than the ordinary one.

Besides nutrient components, vegetables have certain other materials (components) which have no food value, but are of great importance in vegetable cookery. They have an affect upon flavor, color and general palatability of the cooked product. These materials are flavoring substances, plant pigments and tannins.

Flavoring substances: Many volatile and non-volatile organic acids contribute to flavor. But volatile aromatic oils are chiefly responsible for characteristic flavor and odor. Some are present in raw state and others develop when food is cooked.

Pigments: The attractive and varied colors of vegetables are due to the presence of pigments distributed in plant tissues like chlorophyll (green) and carotenoid pigments (red and yellow)

Tannins: Complex organic compounds are widely distributed in plants. They have astringent properties. Tannins of tannic salt form greenish purple compound, which upon oxidation turns brown.

11.4 Few Famous Vegetables and Their Uses

- **Cabbage**

Head cabbage is formed by thick, overlapping leaves attached to a stem. The head ranges in color from a very light green, almost white, to dark green. Also available is red variety. Red cabbage is identical to the green/ white variety except for color.

Chinese cabbage has long, loosely packed leaves. The color of the leaves is white, deepening to green at the stem. This is a mild flavored cabbage often used in oriental cooking and salads.

Savoy cabbage has yellowish, crimped, wrinkled leaves. The size of the head is about the same as that of iceberg lettuce. Savoy has a mild flavor and the texture of the leaves make an interesting addition to cooked dishes and salads.

- **Brussels Sprouts:** Brussels sprouts are green in color and bright in appearance. They look like miniature heads of cabbage. Sprouts can be boiled, baked or steamed.
- **Cauliflower:** The term *cauliflower* comes from a Latin term meaning cabbage flower or stalk flower, a cultivated descendant of the common cabbage.
- **Kohlrabi:** Kohlrabi is light green to white in color, round or globular in shape and averages 3-6 inches in diameter. Its leaves are similar to a turnip's leaves. The term kohlrabi is of German origin and means "cabbage turnip".

  It is best when steamed, hey peeled and cut julienne. It can be served hot with butter or marinated in French dressing. Cold, it can be served as a salad or as an accompaniment to cold meat.
- **Broccoli:** Broccoli has a deep green color in the leaves, and stems with deep green or purplish green, compact buds in the head. Yellow flowers in the buds indicate old, tough broccoli. The more yellow seen in a bunch, the lower the quality.
- **Asparagus:** There are two types of asparagus, white and green. There is a vast difference in the taste or texture of the two. White asparagus is more expensive, because it must be shielded from sun to keep it white. White asparagus cannot be eaten raw, it is too tough. It should be partially peeled before cooking.

  Asparagus is used in a number of ways. It is complemented by butter, hollandaise sauce and vinaigrette dressings of all types. Asparagus pieces can also be utilized in cold salads, soups or casseroles.
- **Celery:** Celery is a member of the parsley family *umbelliferal.* There are two types: Golden heart, which is very white in color, and Pascal, which is dark or light green in color. Pascal, the most popular celery, is less stringy and has a distinct flavor.

Every part of the celery can be used in cooking. Trimmings and tender leaves are good for use in stocks. The outer ribs can be cooked as vegetables or as flavoring in various preparations. Celery can be eaten raw, diced and added to a variety of salads, where it adds texture, flavor and color. Celery can be braised, creamed or served augratin. The celery seed is also used as a seasoning. In general, it is a valuable vegetable in food preparation.

- **Swiss Chard:** Swiss chard is a dark green vegetable, with crinkled leaves and a firm white stalk.
- **Spinach:** Spinach, when fresh, is a crisp, dark green leaf. The curly or flat leaves are best for cooking.
- **Kale:** Kale has hardy, curly leaves which are deep green in color. High quality bunches should have large leaves, be free of bruises, clean and with little discoloration. Kale can be used as a steamed vegetable or served raw as a garnish.
- **Sorrel:** Sorrel has narrow, pointed leaves in the shape of an arrowhead. They are a dull light green color.
- **Endive:** Endive grows in a head. It is a grouping of narrow, ragged edged leaves which curl at the ends. The center of the head is yellowish-white and has a milder taste than the bitter outside green leaves. It Is used primarily as an ingredient in green salads or as a garnish.
- **Lettuce:**

Crisp head (iceberg) lettuce grows as a compact, overlaying, set of green to greenish white leaves. Fresh heads should be firm but not hard. Lighter, springier heads of lettuce will have a sweeter taste. They are also easier to separate for use in salads or sandwiches.

Butter head (Boston bibb) lettuce grows in a head of loosely overlapping leaves. The outer leaves are light green color, the inner leaves light yellow. This lettuce has soft, pliable leaves which have a delicate, buttery flavor.

Romaine (cos), a long, loaf-shaped head of lettuce has long, narrow, smooth edged leaves. The outer leaves are dark green, the inner leaves golden yellow. While the leaves golden yellow. While the leaves appear coarse, they are really sweet, tender and crisp.

Leaf lettuce grows as a bunch of leaves which loosely branch from a center stalk. The leaf is curly and can vary in color from dark green, to light green to red tipped, depending on the variety. The leaves are crisp in texture, but more delicate than iceberg.

- **Pea :** The pea comes from a vine cultivated for the rounded, smooth or wrinkled, edible protein rich seed. Peas can be served with butter, creamed, in salads, soups or stews.
- **Beans :** Beans us the name given to edible seeds. Historically three types, soy, kidney and broad beans, have been important food sources.
- **Cucumbers:** Cucumbers, botanically, are considered a berry. Today there are over 20 different species of cucumber. These include green, white, yellow, long, short, thin stubby, smooth skinned, rough skinned, early maturing, late maturing and others.

Cucumbers can be eaten raw, cooked or pickled. Raw and pickled, they are normally used in salads, sandwich fillings, or as a garnish. As a cooked vegetable they are best braised or lightly sautéed.

- **Okra:** This is a tender, furry pod, light green in color. Okra is good in soups and stews. It combines well with other vegetables, especially tomatoes.

- **Eggplant:** Eggplant is a large, heavy vegetable, usually pear shaped and dark purple in color. The shape and color of the plants can vary widely. Eggplants range from round to cucumber shaped. In color they can be purple, purple-black, yellowish, white, red, or striped.

  It is not eaten raw, but can be eaten marinated. Eggplant can be fried, sautéed, or combined with other vegetables in many types of casseroles.

- **Tomatoes :** By definition, tomatoes are a berry. They are pulpy, contain one or more seeds and no stones. They can vary in shape from somewhat spherical to plum shaped or an elongated pear shape. Tomatoes are usually red, but can be yellow. They are eaten raw in salads, fried, made into soups and sauces.

- **Squash:** Squash are gourds that are eaten for their meat, and sometimes seeds. The rind may be eaten, depending on the type of squash.

Summer squash includes yellow crookneck and zucchini. These types of squash are very popular and are 98 percent edible. Both the skin and seeds of this squash are eaten. They have a tender, either yellow or green skin. When fresh they should be semi-soft.

Winter squash includes acorn and butternut squash. The skin and seeds of these are inedible. Acorn squash is dark green in color with tings of orange in the skin. It is called acorn because of its similarity in shape to the nut. The flesh of acorn squash is a pale, creamy yellow, with a fine grained, dense texture.

Butternut squash is nearly is nearly cylindrical with a bulbous end. The skin is smooth, hard and light creamy brown or dark yellow in color. The flesh of butternut squash is dark yellow to orange, with a fine grain and dense texture.

Winter squash are best baked and glazed. Summer squash can be boiled, sautéed or baked. It is good mixed with other vegetables in sauté dishes. Winter and summer squash are good additions to soups and stews. The pulp of these squash can be used in pies, baked goods, muffins, quick breads and custards.

- **Pumpkin:** It is a bright orange squash, the pureed pulp of the pumpkin is available canned, year-round. It is a popular ingredient in pies and custards. Pumpkin is also good in soups, breads, cookies and stuffing's. The seeds of the pumpkin are good roasted.

- **Onions:** The onion is a common garden vegetable, an edible bulb, with a pungent flavor and aroma. Most onions are of the single bulb variety. They range in color from silvery white through yellow to red. Onions vary in shape, including round, oval and pear-shaped. They are grown in all parts of the world and are the most widely used flavoring agent.

  They can be used raw or cooked. Onions are good boiled, baked, sautéed, fried, creamed, steamed, roasted and pickled. Use them in soups, stews, sauces or salads.

- **Shallots:** These are bulbs which grow in clusters. They are tiny, spherical and a bit elongated. Shallots have a dry, papery skin. The flesh varies in color from white to tinged with purple. Shallots have a subtle flavor of both onion and garlic. They are excellent in all types of cooked dishes.

- **Leeks**: They have flat green leaves and a long white stalk. They are 1 to 1-1/2 inches in diameter and 6 to 8 inches in length. Their flavor is more subtle than that of the onion and is used to flavor stocks and sauces. They can also be baked or braised.
- **Chives:** These are tiny onions, whose roots and tops are used for flavoring. The greens are pencil thin and can be purchased fresh, freeze-dried, frozen or canned.
- **Mushrooms:** Mushrooms are not actually a vegetable. They are an edible fungus. They can add flavor and texture to meat, poultry, seafood, cheese, and egg dishes. The mushroom is also popular prepared as a side dish, sautéed of fried. They are excellent, raw, in salads or stuffed as an appetizer.

  Mushrooms are rich source of protein and contain 20-40 per cent on a dry weight basis. The proteins of mushrooms are of high quality low only in tryptophan content.

  Due to its calorific value, fresh mushrooms can form an excellent slimming diet. As fresh mushrooms contain less fat, they can be consumed by patients having hyperlipidaemia. It has low carbohydrate content and it also suitable for diabetics.
- **Artichoke:** This vegetable resembles a thistle, with thick overlapping leaves, tipped with thorns. They are usually dark green, but can also be bluish, violet, brown or red, depending on the variety. Heads vary in size from there to five inches in diameter.

  Inside the covering of leaves is the heart, which is surrounded by a fine hair-like growth, called the choke. If permitted to mature, the choke would become a flower. This choke is not edible. The base of each leaf and the heart are edible.
- **Carrots:** These are a vegetable almost taken for granted. We use them so often that they lose their separate identity as a vegetable. They are a basic ingredient in a variety of preparations in the kitchen.

  There are two types of carrots. Early summer carrots are sold with or without their leaves. This long, cylindrical, slender root has firm leaves and a vivid orange color. The shape of the carrot may vary some with the variety. Winter Carrots are a large fleshy root with a reddish-orange color and lighter core. The color of root varies with the type and where it is grown. Carrots of all types can be eaten raw, cut into strips or grated in salads.

- **Parsnips:** These look like white carrots. They are a fleshy, thickened, creamy white taproot (the main root of the plant that grows straight down in the ground) with a rather aromatic flavor. The sweet flavor of this root makes it a very good eating vegetable. To prepare parsnips, wash and peel the tuber. Then, if needed, dice, slice or cut it in strips. Parsnips can be used in soup and stew or baked or mashed as a separate vegetable.
- **Radish:** It is an herb-type plant which forms a thickened tap root. There are a variety of other radishes including those which are bi-colored or white and have longish, blunt or pointed roots. Radishes can be sliced or grated. They are most often eaten raw in salads or used as a garnish.
- **Salsify**: It is a straight, white, fleshy root, about 20 inches long, with brown-black skin. It resembles a thin parsnip. They are excellent with grilled meats, when lightly sautéed in butter and sprinkled with herbs.

- **Garden turnips:** These are flat, semi-long to long, white-fleshed tubers, which sometimes have colored heads. The young tubers have a mild flavor. Usually, turnips are eaten cooked, because raw turnips sometimes have a strong, bitter taste.
- **Potato**: The potato is the edible, starchy tuber. Potatoes may be round, oval, irregular, oblong or even kidney shaped. They vary in weight up to one pound. Depending on the variety, they range in color from whitish brown through purple. The interior color ranges from white to light yellow.

11.5 Selection of Vegetables

The desirable characteristics of different vegetables is al follows.

- **Beans**: tender, fresh, crisp, clean, firm velvety to touch, seeds, should be less than half grown, should break easily with sharp sound.
- **Cabbage**: fresh, should be compact, no insect holes, no yellow or withered leaves
- **Carrots**: firm fresh, smooth, yellow orange in color, there should not be any wilted, soft or flabby portion.
- **Cauliflower**: compact, no insects, fin heads, tender green leaves, should not be rough, flowers should not be spread out. The flowers should not be yellow. Yellow color indicates over maturity.
- **Brinjal**: firm, bright, uniform dark rich purple or green color, free of scars, or decay, should not be wilted, flabby or soft, no insect holes.
- **Ladies finger**: young, tender, fresh tips should be broken easily, should not have any holes which indicate infestation, should not be hard while cutting.
- **Greens**: tender, fresh bright green, no holes in the leaves, no withered leaves, not with too much of water, no soft portion of leaves.
- **Tomatoes**: bright red in color, firm, should not be soft, plump body with uniform red color, no holes, no softness, no black, no over ripened, no cracks.

11.6 Preliminary Preparation

Washing: Most vegetables grow near or in the ground. They are contaminated by dirt, sprays, sand and various kinds of microorganisms some of which are acquired from the soil and some from the many contacts incident to marketing. Thorough washing in water is essential. If vegetables are consumed raw, extra care is needed in cleaning them. Cauliflower flowerets are washed with hot salt water to remove the insects. Greens are put in a large basin of water. The impurities like dirt and sand settle to the bottom and leaves are lifted from the top. Vegetables can be washed under running tap water.

Peeling: Roots and tubers are peeled before cooking. It is better to remove the skin after cooking because the nutrients present under the skin would seep inside during the process of cooking, skin can be removed easily, loss of colour can be prevented and sweetness of the carrots are better retained.

Blanching: This is done to destroy microorganisms, denature enzymes, to remove the skin easily and to improve the color.

Apart from these preliminary preparations, cutting, grating, grinding and stringing are also done before cooking.

11.7 Effect of Cooking on Vegetables

Vegetables are cooked to improve the colour, flavour and texture by which overall palatability is improved. Digestibility is also improved. The fibre becomes softened, starch gets gelatinized and protein gets coagulated. Cooking vegetables adds variety to the diet. Cooking destroys microorganisms.

Water content: Water may be absorbed if the vegetable is cooked submerged in water or steam. Removal of water occurs during baking. Excess water absorption tends to produce sogginess in the cooked vegetable.

The bulk of the leafy vegetables is greatly decreased as they wilt during cooking. Spinach and other greens are softened visibly during steaming or other heat treatment because the cell walls become increasingly permeable when they are heated, which causes loss of water and consequently loss of turgor in the cells. This change is evidenced by the wilting of the leaves and accumulation of water from the cells in the bottom of the pan.

Other Carbohydrates: Gelatinization of starch takes place during boiling e.g., potatoes get gelatinized during boiling. Dextrinisation of starch takes place when potatoes are fried. Hydrolysis of starch occurs and they are converted to simple sugars. Caramelisation of sugar occurs when vegetables g scorched or burnt e.g., onions.

Protein: It gets coagulated completely or partly during cooking.

Cellulose: It disintegrates and becomes soft and mastication is facilitated

Flavor: Flavor is affected during cooking, and over-cooking adversely affects flavor. A covered pan increases the intensity of flavor

Pigments: The color pigments of fruit and vegetables are chlorophyll, carotenoids, flavones and anthocyanins. Green vegetables because of their chlorophyll when cooked, for a long period at high temperature tend to lose their color. The green colored vegetables are cooked in an alkali medium, to preserve the loss of color, but certain nutrients are lost. But carotene of cooking is not lost while cooking, in fact it brightens the color. Anthocyanins, in red and purple colored vegetables like red cabbages, beetroots which are highly soluble in water and high temperature, bleach them. Flavones are found in white onions, cauliflower, etc. their white color could be improved by cooking them in water to which lime juice or vinegar has been added.

Pigment	Vegetables	Cooking Media			Over Cooking
		Salt/ Neutral	Acid	Alkali	
White / Flavones	Cauliflower	Yellowish	white	yellow	Grayish
Red / Anthocyanins	Red Cabbage, Beetroot	Fades	Bright red	Blue	Greenish
Green / Chlorophyll	French Beans, Spinach	Bright	Olive	Bright but mashy	Olive
Orange or Yellow / Carotenoids	Carrots	Fades lightly	Same	Same color, but loss of nutrients	Fades

11.8 Loss of Nutrients during Cooking

Some amount of losses occur during cooking as the food get exposed to different conditions. Losses begin from pre-preparation onwards.

Mechanical losses

During pre – preparation like peeling the vitamins presents under the skin may be lost. Vegetables like carrots have a valuable layer of nutrients under the skin so they should be scraped but not peeled thick.

Throwing away outer leaves of cabbage can result in loss of carotene as greener leaves contain higher amount of carotene. Beet root, carrot and cauliflower leaves are very nutritious, hence discarding these leaves results in loss of nutrients.

Solvent action of water

Water soluble nutrients like thiamine, riboflavin nicotinic acid, pantothenic acid, pyridoxine, folic acid and vitamin C may be dissolved in the cooking water and the nutrients may be lost. Losses by solution can be reduced by following methods.

- Cut the vegetable into bigger pieces so that the exposure of the vitamins to water is less. When carrots are cut in crosswise the loss of ascorbic acid is greater than that when they are cut lengthwise.
- Soaking or washing time should be reduced. So that enough time is not given for the water soluble nutrients to get dissolved in water.
- Wash the vegetables with the skin and later should be peeled and cut.
- Use as small quantity of water as possible so that there is no extra water at all.
- Cook for a short time. As period of cooking increases more and more of ascorbic acid leaches into the water.

- Cook the vegetables by steaming and pressure cooking, where no additional water is added.
- Cover the vessel with a lid to hasten the cooking process.
- Soak in salted water vegetables like potatoes which reduce the loss of ascorbic acid by leaching.
- Cook the vegetables with the skin so that the leaching of vitamins into the water would be less.
- Leached water can be used in cooking.

Oxidation and chemical decomposition

Losses of nutrients can occur by chemical decomposition which may be caused by the reaction of the cooking water or by heat.

In most plant tissues there is an enzyme ascorbic acid oxidase which is separated from ascorbic acid in the intact cells. When leaves or fruits are bruised, pounded or chopped, cell structures are damaged and the enzyme gains access to the vitamin and begins to destroy it.

Vitamin C is readily oxidisable and if this proceeds beyond the stage of dehydro ascorbic acid, all vitamin activity is permanently lost. Oxidation may be accelerated by enzymic action, by heat, by an alkaline medium by traces of copper and by free access to atmospheric oxygen.

Vitamin A gets oxidized by dehydration or application of dry heat. Prevention of losses by oxidation or chemical decomposition.

- Cut the vegetables into bigger pieces so that the exposure is less.
- Cut and use it immediately. By grinding, the losses will be more due to greater atmospheric exposure. By extraction of juice the losses are greater.
- Start cooking with boiling water. The greatest destruction of ascorbic acid occurs during the first minute or two of the cooking period. This destruction is the result of the presence of both oxygen and of oxidizing enzymes in the plant tissue. Water should be boiling when the vegetable is put to cook to expel oxygen from the tissues, to eliminate oxygen dissolved in the cooking water and to inactivate the enzymes present in the tissues which catalase the oxidation of ascorbic acid.
- Cover the pan so that there is no direct contact with the atmospheric oxygen.
- Use a sharp knife. When sharp knife is used to cut cabbage bruising is avoided and loss of ascorbic acid is reduced.
- The more alkaline the solution, the faster is the rate of destruction especially temperature and time of heating are increased. Ascorbic acid is protected to some extent when heated in the natural acids of certain foods such as tomatoes, vinegar, tamarind and lime juices. The use of baking soda increases the loss of thiamine and vitamin C hence very small amounts of baking soda should be used.
- After cooking the food has to be consumed immediately; even if it is kept in the refrigerator, the losses continue to occur.

Riboflavin and niacin are stable even at 100°C. Riboflavin is sensitive to light. Food which are exposed to sunlight before cooking causes riboflavin loss. Minerals are not easily destroyed by cooking.

The richer the vitamin C in the raw vegetable the more is the retention in steaming and pressure cooking.

Retention of ascorbic acid is better in covered pan compared to open pan because the cooking process is hastened and contact with the atmospheric oxygen is less.

11.9 Storage of Vegetables

Most fresh vegetables retain their top equality for only a few days. All green vegetables of high water content are best when fresh. If allowed to stand long after gathering, the vegetables become wilted and tough through loss of moisture. The flavour is also impaired because of enzyme action and the conversion of sugar to starch. Mature vegetables particularly roots, tubers and bulbs deteriorate less in storage than do fresh immature vegetables. One reason for the short storage life of many vegetables is that they are rapidly respiring.

Most fresh green vegetables may be kept fresh and crisp in covered containers or plastic bags in the refrigerator. If they are washed before storing they should be drained thoroughly because too much moisture can increase the possibility of a spoilage and decay. Seeds such as peas can remain fresh longer if left in the pods. Tubers and bulbs can be stored in a cool place without refrigeration. Many vegetables, especially the leafy ones, spoil quickly after harvest.

Factors affecting storage life

- **Loss of water**: Transpirational loss of water is one of the main processes that affects the commercial and physiological deterioration of vegetables after harvest. The moisture loss adversely affects the appearance, texture, flavour and weight of the products. Most noticeable effect of moisture is the softening of the tissues caused by loss of turgidity.
- **Respiration and metabolism**: Vegetables are living commodities and continue to respire even after harvest. Respiration uses the stored food, leading to its depletion and consequently the loss of quality. Hence, storage life of vegetables is influenced by rate of respiration and is associated with biochemical activity. Vegetables are classified as follows depending on the rate of respiration.

Very low respiring	:	potato, onion
Low respiring	:	carrot, celery, cabbage, cucumber
Moderately respiring	:	cauliflower, lady's finger
High respiring	:	broccoli, pod-pea, sweet corn

The low respiring commodities have a long shelf life in contrast to the short life of high respiring commodities.

- **Microbial spoilage**: Vegetables are susceptible to the action of a variety of microorganisms, thereby leading to substantial decay losses during post harvest handling.

One common method is to adjust the permeability of the packaging to match the respiration of the fruit or vegetables so that oxygen and carbon dioxide inside is optimally maintained. The proportion of oxygen inside the package has to be lower than in air and of carbon dioxide higher. Such a mixture reduces the rate of respiration, inhibits the synthesis and retards microbial growth.

Tropical vegetables (bread fruit, brinjal, cucumber, gourds, okra and plantain) and a variety of greens (amaranthus, curry leaf and mint) are in general susceptible to chilling injury. Therefore,

these are to be stored at temperature between 8° and 12°C. At this temperature, the rate of metabolism of these commodities is still considerably high, which reduces both the quality and storage life.

11.10 Role of Vegetables in Cookery

- They are used in curries, salads and in sambar.
- They are used as garnishing agents e.g. shredded carrot and coriander leaves.
- They are used as stuffing in samosa and parathas.
- They are used as thickening agents in gravies and soups.
- They are used in chutney (onion) and pickles (tomato, onion)
- They are used as part of recipes like pulao, aluvadi and in non vegetarian dishes.

11.11 Introduction to Fruits

Fruits of all types are used in a wide variety of ways in the kitchen. They are served raw, marinated and cooked. Fruits are often used as a source of flavor, texture and color variation in dishes. They are also widely used in the preparation of delectable sauces and condiments. These luscious food items are often the perfect complement to the flavor of meats, poultry and vegetables. As jellies, jams and preserves, they make the consumption of bread and cakes more enjoyable.

11.12 Classification of Fruits

Fruits are divided into groups depending upon the shape, cell structure, type of seed or natural habitat. One system classifies them into the following groups: berries, citrus fruits, drupes, grapes, melons, pomes, tropical and subtropical fruits.

11.13 Composition and Nutritive Value of Fruits

Berries	Strawberries, gooseberries, blackberries, raspberries, blueberries, Cranberries.
Citrus fruits	Sweet limes, oranges, tangerines, sour oranges, lime, lemon, Grapes fruits.
Drupes	Apricot, sweet cherry, peach, plums.
Grapes	Green grapes, black grapes, seedless grapes.
Melons	Musk melon, water melon.
Pomes	Apples, pears.
Tropical and subtropical fruits	Amla, avocado, banana, dates, guava, jack fruit, mango, Jambu fruit, papaya, passion fruit, pineapple, pomegranate, Sapota, Custard apple

Flavor: The flavor of fruits is the result of their content of sugars, organic acids, mineral salts and aromatic compounds. Among the fruits valued for their sweetness are apples, melons, pears, peaches, apricots and figs.

The acids that contribute to the flavor of fruits are primarily malic and citric, with tartaric present in some fruits, such as grapes. These are all non-volatile acids. It is malic acid which predominates in apples, apricots, cherries, pears, plums, peaches and bananas. Citric acid is the primary acid present in oranges, grapefruit, lemons, loganberries, raspberries and tomatoes. Although these acids do contribute to the flavor of the fruits, t6he total acid content of fruits in general is not considered high. Apples contain 0.60 percent or less acid and lemons 6.0 percent when calculated (malic acid in the apple and citric acid in the lemon) as a percentage of the edible portion of the fruit.

Texture: The texture of fruits is largely determined by the cellulose, which forms the walls of the plant cells, in combination with pectin and other substances. It is the water content within the cells of the plant that determines the crispness of the tissue. When water is lacking, the cells begin to contract, wilting the structure. It is for this reason that many fruits, as well as green vegetables, should be stored in a very humid environment.

The cellulose, which forms the structure of the fruit, is softened by cooking. This alteration is retarded by the presence of acids within limits and accelerated by the presence of alkaline substances.

Fruits are very poor source of protein and fat. Avocado is the exception containing 28% fat. Mangoes are excellent source of carotenes.

Pigments: Like vegetable, fruits also contain different pigments.

- **Chlorophyll**: Guava, gooseberry, country apple.
- **Carotenoids**: Mango, papaya, orange, watermelon (lycopene), musk melon (B-carotene), jackfruit, peaches, (violaxanthin) tomatoes, grape pink (lycopene, b-carotene) pine apple (violaxanthin b-carotene)
- **Anthocyanins**: Grapes, blueberries, plums, cherries.
- **Anthoxanthins**: Guava, apple, gooseberry, pears, custard apple, banana.

Fruits contain 75 to 90% water.

11.14 Selection of Fruits

It is not possible in this text to discuss the selection criteria for all the various fruits. However there are some basic criteria for selection of any fruit.

- The quality of fruit chosen will be guided by the intended end use. if the fruit is to be presented to the customer whole, or in a manner that makes the appearance of the skin important, then the purchase of the highest quality available is important. However, if the fruit is to be cooked or peeled and cut into small pieces, the exterior appearance may not be as important. Less attractive and less expensive fruit may serve the purpose adequately.
- Fruit should always be chosen that has a texture consistent with the standard for the fruit being purchased. Overly ripe fruit will quickly lose its firmness and the flavor will change. Fruit which is not ripe may be hard and will not have fully developed flavor.

- The aroma of the fruit should be fresh and pleasing, with no off odors. for this reason do not store them close to onions, truffles or other items that emit strong odors.
- Avoid fruits with excessively thick skins, or skins which are bruised or broken in any manner.

11.15 Browning Action of Foods

Enzymatic Browning: The rapid darkening of the cut surface of apple, (brinjal and potato) and banana are examples of enzymic browning. Normally the natural enzymatic compounds present in intact tissues and do not come into contact with the phenol oxidases present in some tissues. When the tissues are cut or injured and the cut surface is exposed to air, phenol oxidase enzyme released at the surface, act on the polyphenols present, oxidizing them to orthoquinones. The orthoquinones rapidly polymerise to form brown pigments.

After they are peeled and cut, it is necessary to protect them from the air as much as possible.

If they are to be held for anything other than a very short period of time, it may be necessary to treat them with citric acid or a light salt solution. This treatment will inhibit browning and will help to preserve the fresh color of the fruit. A solution of one cup water with one teaspoon of lemon juice is sufficient to slow the browning process. Be careful with the amount of lemon or other citrus juice used. Otherwise the natural flavor of the fruit will be over-powered by that of the citrus. A light salt solution may be used for this purpose, but is not as effective.

Antioxidants like sulphur dioxide, sulphates and bisulphates inhibit effectively browning.

NOTE: Do not soak any fruit in either a citrus juice or salt solution for an extended period. If you do, the fruit will acquire an acidic or salty taste.

Non-enzymatic Browning: Non-enzymatic browning in lime juice is accompanied by an increase in off flavour, which also limits shelf life. During evaporative concentration of lime juice, rise in temperature leads to browning pigment formation.

Ascorbic acid is responsible for the development of browning reactions in fruit juices and concentrates and in canned vegetables.

11.16 Handling & Storage of Fruits

As a culinarian, it is important that fruit is a living organism even after it is picked. This means that is continues to breathe and age. The higher he respiration level of the fruit, the faster it ages. The higher the storage temperature, the higher the respiration rate. For this reason it is best to store the majority of fruits under refrigeration.

Although fruits should fruits should be stored under refrigeration, caution must be exercised to prevent freezing. Fruits which have been allowed to freeze even partially will wilt rapidly when they thaw. They develop very soft flesh and can possibly discolor. It is difficult to state one overall temperature for the storage of fruits, because, as with vegetables, each differs. For oranges, 32°F with 90 percent humidity is best; for lemons 58-60°F

11.17 Role of Fruits in Cookery

- Fruits can be pert of salads

- Fruits are used to make jams and jellies
- Citrus fruits are used to make marmalades
- Fruits are used for flavoring foods
- Fruits are used for garnishing dishes
- Fruits are used as functional foods

11.18 Conclusion

The preparation of vegetables is a cornerstone of cooking. It requires a concern for the nutritional value, texture, flavor, and color of the item. To achieve a balance of these four factors requires a knowledge of the affect of heat, acid, and other physical actions on the vegetable. When the factors and what affects them are understood, the results can and should be excellent.

The handling and preparation of fruits and vegetables is, in many ways, simple. Yet the results are extremely rewarding. These versatile food items bring color and variety to any meal. When properly handled they contribute greatly to the health of the consumer. As a culinarian, strive to protect this valuable resource.

11.19 Self Assessment Questions

1. Classify fruits and vegetables? Give examples of each type with their uses in cookery?
2. List three points susceptible for enzymic browning and discuss how to avoid it?
3. Discuss the guidelines for selection of fruits and vegetables?
4. Write a short note on storage of fruits and vegetables?
5. Discuss the role of vegetables in cookery?
6. Discuss the various ways of losing nutrients while cooking vegetables. What are the preventive steps can be taken to avoid this?

11.20 References

1. Food science 3rd edition by B Srilaskhmi
2. The Art and Science of Culinary Preparation by Jerald W Chesser

LESSON 12

Cereals and Pulses

12.0 Objectives:

- To introduce and discuss the structure and composition of different cereals and pulses
- To discuss the effect of heat on cereals
- To explain the different processing procedures of pulses
- To discuss the role of cereals and pulses in cooking.

Contents

12.1 Introduction to Cereals

The cereal grains are seeds of the grass family. The word cereal is derived from ceres, the roman goddess of grain. The principal cereal crops are rice, wheat, maize or corn, rye, oats, barley, jowar, bajra, and ragi. The term cereal is not limited to these but also flours, meals, breads and alimentary pastes or pasta.

The ease with which grains can be produced and stored, together with the relatively low cost and nutritional contribution has resulted in widespread use of cereal foods. They are the staple foods in the diets of most population groups.

12.2 Structure and Composition of Cereals

The overall structure of all cereal grains is basically similar differing from one cereal to another in detail. The percentage of endosperm, germ and bran of cereal are 83, 14½ and 2½ respectively.

Bran or Pericarp: The outer layer, epidermis of the cereal consists of thin walled long rectangular cells. Next to the epidermis is the hypoderm of varying thickness. The innermost layer of pericarp tears during the ripening of the seed and in the mature grain they are represented by a layer of branching hypha-like cells called tube cells.

Endosperm: The endosperm itself consists of cells mainly of starch and protein, the starch being in the form of spherical granules which are single granules or tightly packed together and embedded in a matrix of protein. The size and shape of the starch grains in the endosperm cells vary from one cereal to another.

Germ or Embryo: The germ consists of many parts. It is separated from endosperm by scutellum which has the function of mobilizing the stored food in the endosperm and transmitting them to the embryo when the grain germinates. The germ and scutellum are rich in protein and fat. Most of the B vitamins in the grain are present in the scutellum.

Carbohydrates: 80% of dry matter of cereals is carbohydrate. The two carbohydrates present are crude fibre and soluble carbohydrate. The fibre constituents are cellulose, hemicellulose and pentosans. Of the soluble carbohydrate, starch is the most important carbohydrate in all cereals. Of all the cereals whole wheat, ragi and bajra contain high amount of fibre.

Protein: The protein content of different cereals varies. Rice contains less amount of protein compared to other cerals. The protein content of different varities of the same ceral also varies. Proteins are found in all the tissues of cereal grain. Higher concentrations occur in the embryo. The types of proteins present in cereals are albumins, globulins, prolamines (gliadins) and glutelins. The proportion of these proteins differs in different cereals. The gliadins and glutenins are known as gluten proteins. the gluten has unique elasticity and flow properties which are used for baking bread other products.

Cereals contain 6-12% protein, which is generally deficient in lysine. They provide more than 50% of protein requirement as they are consumed in large quantities. Among cereals, rice protein is of better quality than the others. Cereals, when consumed with pulses, the protein quality improves due to mutual supplementation. Cereals are deficient in lysine and rich in methioinine. Pulses are deficient in methionine and rich in lysine. Hence there is improvement in protein quality of both proteins.

Lipids: Lipids are present to the extent of 1-2% in wheat and rice, and 3% in maize. More lipids are present in germ and bran than in other parts of the grain. Wheat germ contains 6-11% and bran 3-5% and endosperm 0.8-1.5%. Lipid content of maize germ is 35% and the bran contains 1%

Considering the amount of cereal consumed it is estimated that fat present in cereals in our diets can meet more than 50% our essential fatty acid requirement. Cereals together with pulses can nearly meet the essential fatty acid requirement of an adult.

Minerals: About 95% of minerals are the phosphates and sulphates of potassium, magnesium and calcium. Some mineral elements like copper, zinc, and manganese are also present in very small quantities in cereals.

Vitamins: Whole grain cereals are important source of vitamin B complex in our diet. Since most of these vitamins are in the outer bran, refining or polishing the grains reduce B vitamin content. Parboiling which includes soaking in water and steaming of paddy results in seeping of vitamins present in outer layer into the grain. Hence milled and polished parboiled rice retains much of the B vitamins. Maida has less B vitamins than whole wheat flour.

12.3 Wheat

Wheat is a grass of the genus Triticum. It is an annual or biennial, according to the variety, and is the major cereal grain of the world's temperature regions. Worldwide, it leads rice in the amount produced and the acreage sown with it.

Wheat contains large amounts of gluten. Gluten is the elastic, sticky, tough substance formed from the insoluble proteins of wheat flour during dough development. It is the gluten, which allows expansion of air cells within the dough as it warms. This is essential to a leavened product. Consequently, wheat makes better bread than other grains. The only other grain that contains appreciable amounts of gluten is rye.

Wheat varieties are grouped in categories according to the texture of their kernels. These basic categories are termed hard and soft.

Hard wheat, as a group, contains more protein/ gluten. They are the preferred flours for bread making. Durum, the hardest wheat, is used mainly in Macaroni and pasta production. Soft wheat are less hardy plants. As a group they contain less protein/ gluten and yield a whither flour. They are preferred for cake, pastry, quick bread and breakfast food preparation. In these types of items the tougher, chewier texture provided by the gluten is undesirable.

12.3.1 Wheat Products:

Flours: Wheat flour is the most important ingredient in the bakery. It provides bulk and structure to most of the baker's products, including breads, cakes, cookies and pastries.

Common **types of flours** used in bakery and patisserie are;

- **Straight flour**: Straight flour is flour made from the entire endosperm. After the bran, germ and shorts are removed, the endosperm is cracked and sifted several times to separate different grades of flour. If these grades, or streams, are recombined, the result is straight flour. Protein content of straight flour depends on the wheat; bit if made from hard wheat it may contain 13 to 15% protein.
- **Patent flour**: Patent flour is milled from the inner part of the endosperm, which breaks into finer particles than the part nearer the bran. Patent flour made from hard wheat is a strong flour of excellent quality and light, creamy color. When a formula for conventional bread calls for bread flour, patent flour is usually selected.

  Patent flours typically range form from 11 to 13% protein.
- **High-gluten flour**: Flour that has especially high protein content is sometimes used in hard-crusted breads and in such specialty products as pizza dough and bagels. It is also used to strengthen doughs made from that contain little or no gluten. Atypical high-gluten flour has 14% protein.

- **Cake flour**: Cake flour is a weak or low-gluten flour made from soft wheat. It has a very soft, smooth texture and a pure white color. Cake flour is used for cakes and other delicate baked goods that require low gluten content. Protein content of gluten flour is approximately 8 percent.
- **Pastry flour**: Pastry flour is also a weak or low-gluten flour, but it is slightly stronger than cake flour. It has the creamy white color of patent flour rather than the pure white of cake flour. Pastry flour is used for pie doughs and for some cookies, biscuits and muffins. Pastry flour has a protein content of about 9%.
- **All-purpose flour**: This is a mixture or blend of hard and soft wheat flour. This type of flour is usually used in home baking due to its versatility. It can be used for cake baking and all types of doughs. It has a protein content of about 11 to 11.5%
- **Whole wheat flour**: This is made by grinding the entire wheat kernel, including the bran and germ. The germ, is high in fat, which can become rancid, so whole wheat flour does not keep as well as white flour.

  Because it is made form wheat, whole wheat flour contains gluten - forming proteins, so it can be used alone in bread making. (Protein content is typically 12 to 13%) however, bread made with 100% whole wheat flour is heavier than white bread because the gluten strands are cut by the sharp edges of the bran flakes.

Pasta: These products include macaroni, spaghetti, vermicelli and noodles. Pasta is made from a strong wheat flour, known as durum flour, made into a dough by the addition of water, live oil and egg. Durum wheat is used because of its yellow-amber color, nutty flavor and also because they hold their shape and firm texture when cooked.

The starchy endosperm of wheat is coarsely ground into semolina which is made with water into a thick dough. The dough is placed in a cylinder, the lower end of which is fitted with a disc perforated with openings and as the dough is forced through the openings various shapes are formed. Macaroni is a tube form, spaghetti is in rod shape and noodles are flat strips. Pasta products are also available in the shapes of shell and alphabets even.

There are two main types of pasta, dried and fresh home-made. Dried pasta is available in at least 56 different shapes, each has a name, and is widely used because of convenience and the fact that the shelf life is up to 2 years if it is correctly stored. Fresh pasta is more and more readily available in a variety of shapes, colors, and flavors from suppliers and there are portable machines for those who wish to produce their own.

Varieties of Pasta:

- Macaroni : Small thin tubes with a slight curve
- Tagliatelle : Long, flat, ribbon shapes of varying widths.
- Ravioli : Small squares off pasta that have a savoury filling between two layers of pasta.
- Spaghetti : Long, rod shape thin strands
- Vermicelli : Thin strands that are wound together into nests.

- Rigatoni : Wider shapes than macaroni and have a ridged edge.
- Farfalle : Squares of paste cut with a crimpled edge and pinched in the center.
- Manicotti ' : Small thin straight tubes.
- Noodles : long flat strips
- Penne : hollow tubes, cut diagonally, may be smooth or ridges
- Fettuccine : Flat egg noodles
- Lasagne : broad, flat noodles, often with rippled edges

12.4 Maize or Corn

In India maize is consumed in the form of boiled or roasted as pop corn. In countries like South America, Central America and Africa, it is converted into food products by grinding, alkali processing, boiling, cooking and fermentation.

12.4.1 Products of Maize:

- **Corn Germ Oil**: It can be extracted by solvent extraction. Maize oil has become a highly desired vegetable oil owing to its relatively high level of linolenic fatty acid and its excellent flavor. The fat content of maize is 3.6% and oil extracted from it can be refined to produce a high quality vegetable oil for cooking or food use.
- **Popcorn**: The popping of corn is a method of starch cookery. As the kernels of popcorn are heated, the water vapor within them expands, increasing the pressure until it is sufficient to make the kernels explode or 'pop'. Desirable qualities in popcorn are good flavor, tenderness, the absence of objectionable hulls and high popping expansion. To make popcorn hard corneous endosperm is desirable. 13.5% of moisture is recommended for best popping expansion. Popping can be done with or without fat.
- Cornmeal: Cornmeal is used to make breads, cakes and pastries.
- **Cornstarch**: It is a highly refined and pulverized starch, made from corn. In refining, the raw starch from the corn is broken up, washed, siphoned and repeatedly strained. The straining removes particles and fiber. Having been pulverized it is then dried to reduce the moisture content to about 10 percent. It is chiefly used to thicken liquids.

12.5 Rice

Rice is an important food crop. It provides over one half of the world's population with low cost, palatable and nutritious food source. Over 90% of the world's rice is produced and consumed in Asia and adjacent islands. There are around 250 different varieties of rice. The main types are

- **Long-grain** : A narrow, pointed grain that has had the full bran and most of the germ removed so that it is less than brown rice. Because of its firm structure, which helps to

keep the grains separate when cooked, it is suitable for plain boiling and savory dishes such as kedgeree and curry dishes etc.

- **Brown grain**: Any rice that has had the outer covering removed, but retains its and as a result is more nutritious and contains more fibre. It takes longer to cook than long-grain rice. The nutty flavor or brown rice lends itself to some recipes, but does not substitute well in traditional dishes' such as paella, risotto or puddings.
- **Short-grain**: A short, rounded grain with a soft texture suitable for sweet dishes and risotto. Arborio is Italian short-grain rice.
- **Basmati** : A narrow long-grain rice with a distinctive flavor suitable for serving with Indian dishes. Basmati rice needs to be soaked before being cooked to remove excess starch.
- **Whole-grain rice:** The wide unprocessed grain of the rice.
- **Ground rice**: It is used for milk puddings. Rice flour can be used for thickening cream soups. Rice paper is used for macaroons and nougat.
- **Wild rice**: It is not actually a rice. It is the grain of one of the most beautiful, single stemmed aquatic plants in America, a wild grass. The value of this grain lies in its unique nutty flavor and its nutritional value. Being easily digestible, it is used in hospitals, for patients with digestive disorders. It is high cost luxury food by virtue of its limited availability. Wild rice is extremely susceptible to all types of natural enemies.
- **Par boiled rice**: The paddy is treated before it is milled. This process retains the vitamin B and helps in minimizing losses occurring during washing and cooking of rice.

  Parboiling involves soaking paddy in water for a short time followed by heating once or twice in steam and drying before milling. Parboiling improves digestibility and protein efficiency ratio is higher compared to raw rice. It swells well more when cooked to the desired doneness and it stabilizes the oil content of the bran.

12.5.1 Rice Products:

- **Rice starch**: Rice starch granules are quite small and are embedded in a protein matrix. To separate them form protein, broken rice is steeped for 240 hours in 5 times its weights of 0.3% caustic soda. The caustic soda treated granules are washed, dried and ground into flour. The flour is then mixed with about ten times its weight of caustic soda solution. This removes gluten. After 24 hours, the starch that settles down is removed, washed and dried. Rice starch is used in puddings, ice-creams and custard powder. It forms a tender opaque gel.
- **Rice bran**: Parboiled or stabilized food grade rice bran is normally finely granulated light tan in color and it has bland flavor and can be used in preparation like bread, snacks, cookies, and biscuits.
- **Rice bran oil**: This oil is rich in vitamin E which gives oxidative stability to the oil. In addition it has higher cholesterol lowering effect than other oils. The keeping quality of this oil is very high when compared to other oils. Foods deep-fried in rice bran oil showed that this oil is less absorbed or consumed in fried foods when compared to food fried in ground nut oil.

- **Flaked rice**: Flaked rice is made form parboiled rice. Paddy is soaked in water for 2-3 days to soften the kernel followed by boiling water for a few minutes and the water is drained off. The paddy is heated in a shallow earthen vessels or iron pan till the husk s break open. It is pounded by an iron pestle or use iron rollers that flattens the kernel and removes the husk. Winnowing separates the husk. Flaked rice is thin and papery and of white color.

12.6 Oat

Since oats are unsuitable for making bread on their own, they are often served as a porridge made from crushed or rolled oats, oatmeal, and are also baked into cookies (oatcakes) which can have added wheat flour. As oat flour or oatmeal, they are also used in a variety of other baked goods (eg bread made from a mixture of oatmeal and wheat flour) and cold cereals, and as an ingredient in muesli and granola. Oats may also be consumed raw, and cookies with raw oats are becoming popular.

12.7 Barley

Barley is a staple food for humans and other animals. It is more tolerant of soil salinity than wheat, which might explain the increase of barley cultivation on Mesopotamia from the 2nd millennium BC onwards. Barley can still thrive in conditions that are too cold even for rye.

Barley must have its fibrous outer hull removed before it can be eaten. Barley grains with their hulls still on are called covered barley. Once the grain has had the inedible hull removed, it is called hulled barley. At this stage, the grain still has its bran and germ, which are nutritious. Hulled barley is considered a whole grain, and is a popular health food. Pearl barley or pearled barley is hulled barley which has been processed further to remove the bran. It may be polished, a process known as “pearling”.

Hulled or pearl barley may be processed into a variety of barley products, including flour, flakes similar to oatmeal, and grits. It may be malted and used in the production of alcoholic beverages. Malting barley is a key ingredient in beer and whiskey production. Two-row barley is traditionally used in German and English beers, and six-row barley in American beers.

12.8 Rye

Rye bread, including pumpernickel, is a widely eaten food in Northern Europe. Rye is also used to make the familiar crisp bread. Rye flour has a lower gluten content than wheat flour, and contains a higher proportion of soluble fiber.

Some non-food uses of rye include rye whiskey and use as an alternative medicine in a liquid form, known as rye extract. Often marketed as Oralmat, rye extract is a liquid obtained from rye and similar to that extracted from wheatgrass. Its benefits are said to include a strengthened immune system, increased energy levels and relief from allergies, but there is no clinical evidence for its efficacy.

Rye straw is used to make corn dollies. Rye can also be used to make homemade sparkling wine by adding sugar and a few grains of rye to the wine during the bottling process. Such sparkling wines usually have more sediment than commercial versions, and the bottles must be

shaken at least once a week to ensure that the rye properly creates carbon dioxide bubbles. Wines made in this manner usually contain carbonic acid, which makes the alcohol in the drink act faster than less acidic drinks such as lager beer.

12.9 Effect of Heat on Cereals

12.9.1 Gelatinisation: Starch granules do not dissolve readily in cold water but they will form a temporary suspension with the starch tending to settle out as soon as the mixture is allowed to stand. When heated with water, the intramolecular hydrogen bonding is broken and grains absorb water and (a) swell (b) the viscosity increases until a peak thickness is reached and (c) the translucency of the mixture also increases.

The term Gelatinisation is used in general to describe these changes. The changes appear to be gradual over a temperature range during gelatinisation. The change transforms the temporary suspension into a more permanent one.

Too much or less Gelatinisation

In some recipes like cooking rice too much of gelatinisation and mushy rice is not desirable. Too much water, too long cooking, too high temperatures should be avoided to prepare desirable consistency. Flaking and puffing hastens gelatinisation.

In some recipes like Kesari, sometimes less than the desirable gelatinisation takes place if sugar or too much fat are added before gelatinisation of the starch takes place.

12.9.2 Dextrinisation: Dry heat also brings changes to starch granules through a process known as dextrinisation. If a starch product is subjected to dry heat carbohydrate compounds called dextrins are formed. When these are dissolved in water they have a sweet taste. Color and flavor changes also occur. Dextrins which are smaller units of starch breakdown can be easily digested by the body. Chapathis, bread toast in almost all mixed cereals and pulses dextrinisation takes place.

12.10 Fermented Products of Cereals

The term fermentation refers to breakdown of carbohydrate and carbohydrate like materials under either aerobic or anaerobic conditions. The organisms involved may be bacteria or moulds. Few fermented products of the cereals are bread, idli, dosa, appam, rice vadam and Dhokla.

Advantages of Fermentation:

- It improves the flavor and texture of the product.
- Nutrients are increased like vitamins B and C
- Fermented products are easily digestible.
- It decreases the PH and inhibits the harmful micro-organisms
- Variety in the diet is increased.

Unfermented Products: The unfermented products of the cereals are cakes, cooked rice and chapattis.

12.11 Role of Cereals in Cookery

- Being comparatively inexpensive, cereals form the staple diet and contribute to most of the calorie requirement and half of the protein requirement. Cereals improve the quality of pulse protein. With the recent emphasis on the importance of dietary fat reduction and increased complex carbohydrate intake (starch and fibre) cereal grains are 'made to order'. They are excellent source of starch and B vitamins. Cereals also contribute to satiety and are used to prepare the main dish. No meal can be made without cereals.
- Cereals are used as thickening agent, e.g., corn flour in custards, rice flour in pulusu, vermicelli in payasam, macaroni in soups.
- Cereals are used as coating agent, for example, maida paste in cutlets or bread crumbs in cutlets.
- Cereals are used in making of desserts like rice kheer, wheat halwa etc
- Cereals are used in making easy to cook products like macaroni, corn flakes and rice flakes.
- Cereals are used as covering for stuffing samosas, puran poli etc.
- Fermented made from cereals are used as breakfast foods or snacks, e.g., idli, dosa etc.
- Cereal flour is used in bakery for making cakes and a variety of breads.

12.12 Storage of Cereals

Most cereals and cereal products have such a low moisture content that little difficulty is encountered in the prevention of growth of micro-organisms as long as the foods are kept dry. Such materials are stored in bulk or in containers so as to keep out vermin, especially insects and rodents.

As a result of infestation, a part of the grain is eaten away by insects and the taste, flavor and hygienic quality is affected. The nutritive value particularly vitamins B and proteins are affected. Pyrethrin and malathon are used to prevent infestation. Volatile oils from Mentha Spicata (mint) can be painted on the containers walls or can be directly mixed with seeds for short term storage. Drying the grains in the sun to an optimal moisture content reduces damage by fungi. The storage bins should be rodent proof.

12.13 Introduction to Pulses

Pulses are edible fruits or seeds of pod bearing plants belonging to the family of the leguminous. The major pulses which find important place in our dietaries are red gram dhal, black gram dhal, green gram dhal and masoor dhal. Some are used as whole grams. Cow pea, rajmah and dry peas also belong to leguminous family.

12.14 Composition of Pulses:

Protein: In a vegetarian diet pulses are important source of protein. They give about 20-25 percent protein that is double the amount of protein compared to cereals. The proteins of pulses are of low quality since they are deficient in methionine. However pulses are rich in lysine. Hence they can supplement cereal proteins.

Carbohydrates: Pulses contain 55-60 percent of starch. Soluble sugars, fibre and unavailable carbohydrates are also present. The unavailable sugars in pulses include substantial levels of ogliosaccharides. Fermentation, germination, cooking, soaking and autoclaving reduce considerable amount of ogliosaccharides.

Lipids: Pulses contain 1.5 percent lipids on moisture free basis. They contain high amounts of polyunsaturated fatty acids. Along with cereals they meet the requirements of essential fatty acids for an adult. Apart from linoleic and most legume seed oils contain high proportion of linolenic acid. They undergo oxidative rancidity during storage resulting in loss of protein solubility, off flavor development and loss of nutritive quality.

Minerals: They contain calcium, magnesium, zinc, iron, potassium; 80 percent of phosphorous is present as phytate phosphorous. Phytin complexes with proteins and minerals and renders them biologically unavailable to human beings and animals. processing such as cooking, soaking, germination and fermentation can reduce or eliminate appreciable amounts of phytin. In amounts used, pulses do not contribute much to the total mineral intake.

Vitamins: Legume seeds are excellent source of B complex vitamins particularly thiamin, folic acid and pantothenic acid. Like cereals they do not contain any vitamin A or C but germinated legumes contain vitamin C.

12.15 Processing of Pulses

Soaking: Many pulses particularly whole grams have hard outer covering need soaking prior to cooking. Whole pulses are soaked in cold water overnight or in warm water (60°-70°C) for 4-5 hours. Green gram, lentils and cow pea cook satisfactorily without prior cooking. Soaking makes the pulse tender and hastens the process of cooking. It also reduces phytic acid and ogliosaccharides.

When legumes are in contact with water, hot or cold, some leaching water-soluble nutrients from the legumes into the water will occur. The process is greatly enhanced in the presence of broken seeds or split seed coats. Water used for soaking can be used in cooking to minimize those losses.

Germination: Whole grams are soaked overnight and water should be drained away and the seeds should be tied in a loosely woven cotton cloth and hung. Water should be sprinkled twice or thrice a day. In a day or two germination takes place. Moisture and warmth are essential for germination. Green gram can be germinated in a shorter time. In summer germination process is faster than in winter. Bengal gram, dry beans and dry peas can also be germinated.

Advantages of Germination:

1. Nutritive value is improved.
    - During sprouting dormant enzymes get activated and digestibility and availability of nutrients is improved. Starches and proteins are converted to simpler substances as germination proceeds, the ratio of essential to non-essential amino acids changes providing more of essential amino acids. Sprouting reduces trypsin inhibiting factors due to the release of enzymes. Germinated seeds have more of maltose. The action opf cystases and pectinases are released during sprouting and the cell wall are broken down and the availability of nutrients increase.

- During sprouting minerals like calcium, zinc and iron are released from bound form. Phytic acid amount is reduced so the availability of proteins and minerals are increased.
- Riboflavin, niacin, folic acid, choline and biotin are increased.
- Vitamin C is synthesizes during germination, hence germinated pulses can be substituted for fruits. The increase in Vitamin C is around 7-20 mg per 100 g of pulses. Vitamin C content is maximal after about 30 hours of germination.

2. Sprouting decreases cooking time. The thick outer bursts open the grain and the grain becomes soft making it easier for the cooking water to penetrate the grain.
3. Dehusking is easier when the grains are sprouted and dried.
4. Germination decreases the mucus inducing property of legumes.
5. Thickening power of starch is reduced due to conversion of starch to sugars
6. Germination metabolizes ogliosaccharides and hence do not produce gas or flatulence
7. Germination improves taste and texture and without much cooking also sprouts like green gram can be consumed.
8. Germinated pulses add variety to the diet.

12.16 Role of Pulses in Cookery

- Pulses are rich in protein and B vitamins and improve the quality of cereal protein.
- Pulses give satiety due to high protein and fiber
- Pulses improve flavor and consistency of dhal, sambar and rasam
- They contribute to fermentation in preparation of idli and dosa
- They are used in snacks like sundal, bajji, panipuri and bhelpuri.
- They are used in salads, for example sprouted gram
- They are used in desserts like paruppu payasam and sweets like pulses mysore pak and laddu.
- They are used as thickening agent and prevent curdling, e.g., Bengal gram flour in kadhi
- They are used as stuffing agent in poorna burelu
- They are used as part of seasonings in curries.

Mostly pulses are cooked and consumed and they take longer time to cook than cereals. The cooking process softens the hard seed by improving the plasticity of the cell wall, thus facilitating the cell expansion and reduction of intercellular adhesion.

12.17 Conclusion

The items and preparation methods presented in this lesson comprise an important rung on the ladder to mastery of culinary expertise. Often regarded as merely secondary items in the meal preparation, cereals and pulses are in actuality some of the most important. They are truly

the staples of the human diet. These products also represent a very desirable part of the meal. They should be selected and p[prepared with care. Cereals and pulses provide important nutritive value, as well as color, flavor and texture in the dining experience of your guest.

12.18 Self Assessment Questions

1. Explain the effect of moist and dry heat on starch products?
2. Explain the role of cereals in cookery
3. What is fermentation? Discuss advantages of it. Give examples for fermented products?
4. Explain the effect of germination on pulses?
5. Describe the role of pulses in cooking?
6. Define pasta? Name ten pastas and their shapes?

12.19 References

1. The Art and Science of Culinary Preparation by Jerald W. Chesser
2. Food Science 3rd edition by B Srilakshmi
3. Book of ingredients by Philip Dowell land Sydney

LESSON 13

Spices and Condiments

13.0 Objectives:

- To introduce and discuss the importance of spices
- To explain various spices and condiments used in cooking with their characteristics and uses
- To discuss the guidelines for using spices in cooking

Contents

13.1 Introduction

Aromatic food substances which enhance flavor are classified into spices and herbs. Spices are dried roots, barks, or seeds used whole, crushed or powdered. Herbs are fresh leaves, stems, flowers of herbaceous plants.

Spices are stronger than herbs, but they can be used in combination without loss of flavor. Herbs are more difficult to mix. This holds true for both Indian and Western cooking.

The use of spices in cooking was originally introduced by the Byzantines. Foodstuffs were preserved in spiced sauces, sometimes to hide the fact that the meat was high, sometimes to replace the flavour lost after lengthy boiling. Most spices come from the East, and the first spice to be introduced to Europe was pepper, from India, which for a longtime was a rare and expensive commodity. Roman food was always liberally spiced, especially with ginger and the practice of adding spices continued through the Middle Ages until the 18th century.

Spice Route: Suppliers of spices increased as a result of the “Crusades” and control of the “spice route” aroused much rivalry. Italy (Romans) obtained a complete monopoly on the distribution of spices in Europe and due to this, the search for alternative sources of supply were searched, which resulted in the great voyages of discovery to America and the West Indies. Once they were discovered, spices became more plentiful and less expensive, the British and Dutch companies, in particular trading them. As time passed on, the belief that spices have miraculous properties reduced and naturally the usage and value reduced, leaving only some spices like saffron expensive

13.2 Importance of Spices and Herbs

Spices and herbs give flavouring and seasoning to the dishes in which they are used. Depending on the availability, regional influences like weather; traditions also play a role in the usage of various spices and herbs in cookery.

The various herbs and spices being used play the main role of flavouring and seasoning the food. Food when cooked should not only please the eye, but should also stimulate the palate. The success of cooking depends largely on the help one obtains from flavourings and seasonings.

Spices and Herbs used to season and flavour may not have much nutritive value but have a great medicinal value in them and of course, they add variety to the dishes they are added to. The main uses of spices include:

1. **Helps in Digestion**: There is ample proof, according to Larousse, that spices are being used in cookery since the evolution of cookery, for example, garlic. Spices like cloves stimulate the flow of gastric juices, garlic, aniseed and asafetida improve digestion and reduce hypertension.
2. **Medicinal Purpose**: Clove oil is used since ages to relieve toothache. Turmeric is one more important flavouring, which has got antiseptic qualities. Garlic and fennel help in digestion, ginger added to tea helps to cure cold. Turmeric is added in milk and given to persons who are in a state of shock.
3. **Enhancing Flavour**: Food remains tasteless and bland if spices are not added as they give good flavour and stimulate the appetite. One has to take care that the flavouring should not be overpowering, but there should be a sense of suspense whether they have been added or not. This mental search for a particular flavour makes the dish more interesting. For example, Monosodium glutamate (also called as MSG, ajinomotto, Chinese salt or testing salt) is a flavour enhancer in meat and fish preparations. Other spices like cinnamon, bay leaf, nutmeg, saffron, pepper, cloves etc., also help in enhancing the flavour of the dish to which they are added.
4. **Improve Appearance**: Some spices add on to or give their colour to the dish they are used, thereby improving the appearance of the dish. Spices like turmeric, saffron, coriander leaves, poppy seeds, ratanjog add colour to the food making the dish more interesting.
5. **Improve Palatability**: Salt, for example is one of the most important seasoning that enhances the taste of food by bringing out the flavour of all the ingredients added in it.
6. **Act as preservatives**: Many food are preserved for a longtime with the help of spices. Salt is used extensively for preserving brine solution. Other spices that have the preservative quality are turmeric, cloves, mustard, ginger, garlic, and asafoetida.

13.3 Important Herbs and Spices used in Cooking

S. No	Name	Characteristics	Uses
1	Allspice	A berry, which combines the flavour of cloves, cinnamon, and nutmeg. Has a spicy sweet, mild, very pleasant flavour. Native of West Indies	Beef stews, boiled fish, mashed sweet potatoes cakes, puddings pies etc.

2	Aniseed	Fruit of an annual plant of the parsley family has a delightful sweet liquorice flavour. Grown in India, Pakistan, China, Mexico etc.	Curries, pickles, fish and shellfish cookery, rolls, cakes, pastry for pies and tarts etc.
3	Capers	Flower heads of Mediterranean caper. Pickled, dried and stored in brine solution	Canapés, hors d'oeuvres, poached fish.
4	Caraway seeds	Elongated seeds, give a strong flavour. Grown in Holland and Germany	Cheese spreads, soups, poached fish, apples, beets, cabbage dumplings, biscuits, cookies, cakes etc.
5	Cardamom seeds	Fruit of a reed-like plant, seeds within the pod are used. Very strong and sweetish flavour, small ones are better. Native of Malabar coast, Jamaica	Pickling curries, stews, fish curries, bhajees, potato dishes, rice puddings, bread, buns, biscuits; etc.
6	Cinnamon	Thin inner bark of the cinnamon tree, has a fragrant odour and tastes pleasant and aromatic. Grown in SriLanka and East Indies.	Paneer curries, ham khormas, shorbas, squashes, biryanis, pulaos, breads, cakes rolls, cookies etc.
7	Garlic	A bulb that has several cloves, all enclosed in one membrane.	Eggs portugaise, pizzas, curries, sauces, coups, fish, hors d'oeuvres, curries etc.
8	Chilli powder	Pods of chillies are dried and powdered, pungent and red in colour. Grown extensively in India	Cheese spreads, curries, Mexican meat dishes, stews, fish curries etc
9	Cloves	Dried flower heads of the clove tree. Native of Zanzibar and also grown in Pamba, East and West indies.	Paneer curries, ham, pork, beef stews, sauces, coups, apples, bread, cookies, gingerbread etc
10	Ginger	Stem and root have a hot flavour. Grown in India and Jamaica	Steak kebabs, tikkas, fish, prawn, chutneys, gingerbreads, cakes, cooies etc.

11	Mustard	It is pungent spice, used as a table condiment	Cheese spreads, boiled eggs, soups, ham, pork, beef, chicken, sauces, jboiled and poached seafood, tempereing, pickles. Etc.
12	Nutmeg and mace	It is seed of the nutmeg tree and has a coat of orangy flesh, which is dried into mace. Grow in Dutch, East Indies and Kashmir	Custards, meat balls, sausages, beef, poached and fried eggs, potato dishes, rice dishes and halwas, bred, cakes, custards, cookies etc
13	Paprika	Dried and ground pimentos	Poached eggs, veal and chicken, goulashes, stews, all pizzas, meat filing for patties, crackers.
14	Pepper	Black and white berries of the pepper plant. Improves flavours and adds piquancy- used as a table condiment	Cheese spreads, devilled eggs, canapés, sauces, poultry, meat and beef dishes, sauces, soups, all fish dishes, all veg dishes, meat filling for patties.
15	Poppy seeds	Seeds of the large poppy plant. Seeds contain very little opium	Cheese mixture, egg dishes, meat and poultry stuffings, curries, khormas, baked and poached fish, gravies, bread rolls, sweet roll fillings, cakes, pralines (chickies)
16	Fenugreek	Dried ripe fruit of an annual plant. Grown in Europe and India. Fresh leaves are used as a leaf vegetable (methi)	Curries, fish and prawn dishes, for tempering pickles.
17	Saffron	Dried stigma, from the flower of the crocus plant. Deep orange colour. Very expensive, grown in Mexico and Kashmir.	Paneer dishes, veal and poultry, Moghalai cuisine, biryanis, pulaos, curries, shrikhand, Indian sweets, halwas etc.

18	Turmeric	Aromatic root of rhizome of a plant grown in India and West Indies. It has a characteristic yellow colour.	Egg curries, meat, fish, prawn curries, biryanis and yellow rice.
19	Coriander	Round, light-brown, hollow seed, slightly sweet, musty flavor	Sausage, gingerbread, curry dishes
20	Cumin	Small seed resembling Caraway, but lighter in color	Sausages, biscuits, fried rice, savories, curry dishes
21	Fennel	Greenish-brown seeds similar in flavor to anise, but larger in size	Tomato sauce, fish dishes, Italian sausage
22	Juniper berry	Slightly soft, purple berries with piney flavor	Marinades, game dishes, sauerkraut
23	Sesame seed	Small yellowish seed with nutlike taste. High in oil content	Bread and roll garnish
24	Star anise	Dried, star shaped seed pod, with an anise like flavor (but unrelated to anise) but more aromatic.	Used primarily to flavor stewed or braised Chinese dishes
25	Oregano	Pungent herb, known as the 'Pizza herb'	Italian and Mexican dishes
26	Chervil	Herb with mild flavor of parsley and tarragon	Soups, salads, sauces, egg and cheese dishes
27	Chive	Grass like herb with onion flavor	Salads, egg and cheese dishes, fish soups
28	Cilantro (Coriander leaves)	Herbaceous aromatic and flavory leaves resemble flat parsley	Widely used in Asian cooking
29	Lemon grass	A tropical grass with a slightly bulbous base and an aroma of lemon	Used in Southeast Asian cooking
30	Rosemary	Light green leaves resembling pine needles	Lamb, braised meats and poultry and soups
31	Basil	The herb has a mild and sweet flavour.	Egg canapés, sandwiches, lamb liver, chops, beef stews, fried fish, turtle soup, etc

32	Bay leaves	Leaves of the common laurel tree. It has a very mild sweet distinctive flavour.	Egg Creole, boiled ham, pickling, stews, soups, sauces, curries, khormas, shorbas, casseroles, pulaos, biryanis etc.
33	Dill	Leaf herb resembling fennel, bitter flavoured herb. helps in the preparation of dill vinegar and gin	Cottage cheese, lamb chops, fish dishes, cabbage and cauliflower dishes.
34	Marjoram	A sage like plant mostly used in Italy. Leaves and flowering shoots are used.	Soufflés, beef and lamb roasts, stuffings and sausages, baked fish, carrots, onion, brusselsprouts, peas, potatoes and zucchini.
35	Mint	Leaf herb, has a pleasant flavour.	Cream cheese, lamb, veal, poached and boiled fish, peas, potatoes, etc.
36	Parsley	Green leafy herb, rich in vitamin A& C and iron.	Egg dishes, cheese spreads, accompaniments, stews, soups, poultry, beef, pork as chicken dishes. All fish and shellfish dishes, used as garnish.
37	Sage		Cream and cottage cheese, pork, lamb, stuffings, chowders and fish stuffings, egg plants, onion, peas and tomatoes.
38	Thyme	Cultivated fragrant leaves, many uses in kitchen. Used fresh or dried.	Eggs, beef, pork, and lamb, crab, scallops, and shrimps, beets and onions.
39	Tarragon	It belongs to the same family as common wood. It gives strong flavour.	Chicken, duck, turkey, goose, and liver paste, salmon, crab, lobster, shrimps asparagus, beans, beets and tomatoes.
40	Fine herbs	A combination of finely chopped tarragon, chervil, and parsley.	Cheese, omelettes, soups, sauces, roast dishes, boiled fish, carrots, and potatoes.

13.4 Guidelines for using Spices and Condiments

- Be familiar with each spice's aroma, flavor, and it's effect on food.
- Store dried herbs and spices in a cool place, tightly covered in opaque containers. Heat, light and moisture deteriorate herbs and spices rapidly.
- Don't use stale spices and herbs, and don't buy more than you can use in about six months. Whole spices keep longer than ground, but both lose much flavor after six months.
- Be cautious after you have replaced old spices. The fresher products are more potent, so the amount you used before might now be too much.
- Use good-quality spices and herbs. It doesn't pay to economize here. The difference in cost is only a fraction of a cent per portion.
- Whole spices take longer to release flavors than ground spices, so allow for adequate cooking time.
- Whole herbs and spices for flavoring a liquid are tied loosely in a piece of cheesecloth for easy removal.
- When in doubt, add less than you think you need. You can always add more, but it's hard to remove what you've already added.
- Except dishes like curry or chilli, spices should not dominate. Often, they should not even be evident. If you can taste nutmeg in the creamed spinach, there's probably too much nutmeg.
- Herbs and spices added to uncooked foods, such as salads and dressings, need several hours for flavors to be released and blended.
- Taste foods before serving, whenever possible. How else can you "adjust the seasoning"?

13.5 Conclusion

The spices and condiments used in the kitchen bring variety of flavor, texture and color to a meal. They also provide important nutrients. Intelligence, carefulness, a through and sound judgment, a steady hand and a keenly perceptive palate are qualifications that every culinarian must posses in order to prepare food that is appetizing and pleasant to taste.

13.6 Self Assessment Questions

1. Explain in detail the role of spices and condiments in cooking?
2. What are guidelines for using spices and condiments?
3. List out 10 different spices used in cookery. Give their characteristics and uses?

13.7 References

1. Professional Cooking 5th edition by Wayne Gisslen
2. Food science 3rd edition by B Srilakshmi
3. Theory of Cookery by Krishna Arora

LESSON 14

Fats and Oils

14.0 Objectives:

- To explain various types of fats and oils, their properties and uses
- To discuss the rancidity nature of fats and preventive measures
- To discuss the role of Fats and Oils in cookery

Contents

14.1 Introduction

Fats and oils are nutritionally useful and in some form, economical sources of energy and give a satiety value to the dish. They also contribute characteristic palatability, qualities of flavor and texture. They are popularly used as the medium of cooking.

Fats are solid at ordinary temperature and melt when heated. Oils are liquids at ordinary temperature. Only coconut oil solidifies at low temperature.

Fat is present naturally in many foods. This fat is often referred to as invisible fat. Example of foods containing appreciable quantities of invisible fats includes meat, poultry, fish, dairy products, eggs, nuts and oil seeds. Visible fats are made from these products. They are lard, cooking oils, salad oils, margarine and butter.

14. 2 Composition of Fats

Oil	Saturated	Mono unsaturated	Poly unsaturated
Coconut	91	08	01
Cotton seed	34	26	40
Groundnut	20	54	26
Mustard	06	73	21
Niger	12	35	55
Palm	80	13	07
Safflower	11	13	76
Sesame	14	46	40
Soyabeen	15	25	60
Sunflower	08	34	58

When fats contain a relatively high proportion of saturated fatty acids such as palmatic and stearic acids, they have relatively high melting points and are usually solid at room temperature. When fats contain a relatively high proportion of unsaturated fatty acids such as the mono unsaturated oleic acid and polyunsaturated linoleic acid, they have relatively low melting point and oils are at room temperature.

14.3 Varieties of Fats and Oils:

Fat / Oil	Source	Properties	Uses
Butter	Cream	Salted or unsalted. Difficult to handle when chilled, unique flavor and enriching qualities	Not suitable for deep-frying. For shallow frying, add 1 tbsp oil to raise smoking point.

Margarine	Groundnuts, palm, coconut and fish oils, milk whey	Not easy to spread when chilled. Distinctive flavor and not to everyone's taste	Economical for making bakery products
Soft-blended margarine	Groundnuts, palm, coconut and fish oils, milk whey	Will spread when chilled	Excellent for all-in-one cake and pastry making
Low-fat spread	Blended vegetable oils	Half the calories of butter, less fattening than margarine	Can be used for bakery products
Cholesterol-free- spread	Vegetable oils	Spreads when chilled	Can be used for bakery products
Aerated white vegetable fat	Blended vegetable oils	More flavor than lard. Easy to mix and creamy texture	Can be used for most purposes, but rather expensive for deep frying.
Lard	Pork	White solid fat	Vary economical. Good for shortcrust pastry when combined with margarine. Does not cream with sugar. Good for shallow frying
Spreading blend	Buttermilk, butter oil, vegetable oil	A mixture of butter and margarine. Low fat content. Just over half the calories of butter. slight butter flavor. Spreads when chilled	Suitable for all cooking, except frying. Baking results acceptable. Do not use for pastry.
Corn oil	Corn		Suitable for all purposes, especially deep frying
Sunflower oil	Sunflower seeds		Suitable for all purposes, especially deep frying

Sesame and almond oils	Sesame seeds and bitter almonds	Delicate flavor	Used for all purposes
Olive oil	Olives	Distinctive flavor	Suitable for most purposes, but not for deep frying
Soyabean oil	Soyabeans	Distinctive flavor	Suitable for most purposes, but not ideal for all dressings. Low shelf-life
Coconut oil	Coconuts	Strong aroma and flavor	Used for all purposes
Arachide oil	Groundnuts	Distinctive flavor	Used for all purposes
Blended oil	Vegetable and animal oils		Can be used for the same purposes as corn oil but needs straining after use if it is to be re-used for deep frying
Solid vegetable oil	Palms		Suitable for all purposes, except dressings because it solidifies when cold.

14.4 Plasticity of Fats

Most fats that appear to be solid at room temperature actually contain both solid fat crystals and liquid oil. The liquid part is held in a network of small crystals. Because of this unique combination of liquid and solid, the fat can be moulded or pressed into various shapes without breaking. This property of fat is called plasticity. The type and size of the crystals in a plastic fat influence the performance of the fat in baked products and pastry. Plastic fats can be creamed that is, mixed with the incorporation of air.

14.5 Hydrogenation

The process of hydrogenation changes liquid oils into more solid plastic shortenings and to increase the stability of the oils to prevent spoilage from oxidation, which results in undesirable rancid flavor and odours.

Hydrogenation takes place in a reactor, where hydrogen gas is bubbled through the liquid in the presence of a nickel catalyst, which speeds up the reaction. Under these conditions the unsaturated fatty acids present in the oil combine with the hydrogen. This chemical process brings about a physical change, the liquid oil becoming a solid fat.

Thereby the melting point of the fat is increased. With sufficient hydrogenation it becomes solid at room temperature. Careful control of temperature and pressure in the hydrogenation

process allows to achieve the desired end result, that is, the proper degree of plasticity. The fat can then be creamed and blended with other ingredients.

Soyabean oil, cotton seed and palm oil are used for hydrogenation. Hydrogenation greatly improves the stability of soyabean oil and therefore its resistance to the development of undesirable flavors.

14.6 Winterization

Some cooking oils become cloudy when they are stored in the refrigerator. This occurs because some of the triglyceride molecules in the oil have higher melting points than other molecules in the mixture and crystallize or become solid at the room temperature.

In manufacturing oils intended to be used primarily for the making of salad dressings, a winterizing process is applied. In this process, the temperature of the oil is lowered to a point at which the higher-melting triglycerides crystallize. Then the oil is filtered to remove these crystals. The remaining oil has a lower melting point and does not crystallize at refrigerator temperatures. It is referred to as salad oil.

14.7 Emulsions

The term emulsion is applied to a system consisting of one liquid dispersed in another liquid with which it is immiscible.

Temporary Emulsions: If oil and water alone shaken together, an emulsion is formed but on standing, the oil particles reunite and separate from the water. These are temporary emulsions. French dressing is the most common emulsion. Rasam seasoned with oil is another example of emulsion.

Permanent Emulsions: A third substance called as emulsifying agent or emulsifier is necessary to stabilize the system and keep one liquid dispersed in the other on a permanent basis.

Emulsifiers have a amphiphilic molecules. Part of the emulsifier molecule is attracted to or soluble in water (hydrophilic) while another part of the same molecule is soluble in fat (lipophilic). If the emulsifier is more attracted to the water or more water soluble, it promotes the dispersion of oil in water. If the emulsifier is more attracted to the oil or more oil soluble, it tends to produce a water-in-oil emulsion.

This third substance is known as emulsifier, stabilizer or emulsifying agent. Common stabilizers are egg yolk, whole egg, gelatin, pectin, starch paste, casein, albumin and fine powders such as paprika or mustard. In cake batters, several emulsifiers like egg, casein, gluten and starch of flour are present.

In preparations like sambar or kadhi or payasam the oil that is used in seasoning does not separate due to the protein and present in them which act as emulsifiers. In thick gravies the oil is not separated due to the masala added which acts as emulsifier.

Mayonnaise is an emulsion, with one liquid (oil) dispersed in a second liquid (vinegar or lemon juice). Egg yolk (lipo protein) acts as emulsifying agent, coating the particles of oil to keep them dispersed.

Shaking, beating, stirring and grinding are methods used to prepare emulsions. Cooked dressings for salads, sauces, gravies, cream soups and flour mixtures in which the fat is dispersed are all classed as emulsions. The dispersing medium may be water, milk, dilute vinegar, lemon or other fruit juice or some other liquid.

14.8 Rancidity of Fats and Oils

Spoilage of fats may occur or storage, particularly if the fats are highly unsaturated and the conditions of storage are conducive to chemical change in the fats. Rancidity is of two types- hydrolytic and oxidative.

Hydrolysis: Hydrolysis is brought about by enzymes that decompose fats into free fatty acids and glycerol. Butyric and caproic acids are the volatile fatty acids predominating in butter are largely responsible for the odour and flavor of rancid butter.

Oxidation: Only unsaturated fats and foods (which have lipoxygenase) are susceptible to oxidative changes. Highly hydrogenated and saturated fatty acids are relatively resistant to oxidation.

The development of rancidity is objectionable not only because of the undesirable changes in odour, flavor, color and consistency of fat but because, it is accompanied by the inactivation of vitamin A and E. Oxidative rancidity may be problem in dry foods containing only small quantities of fat, such as prepared cereals.

Prevention of Rancidity

- Fats can be protected against the rapid development of rancidity of controlling the conditions of storage.
- Storage at refrigerator temperature prevents rancidity
- Rays of light catalyze the oxidation of fats. By the use of colored glass containers that absorb the active rays, fats can be protected against spoilage. Certain shades of green bottles and wrappers and yellow transparent cellophane wrappers are effective in preventing rancidity.
- Vacuum packaging also helps to retard the development of rancidity by excluding oxygen.
- Antioxidants naturally present in the food such as vitamin C, beta carotene and vitamin E protect against rancidity.
- Antioxidants can also be added like butylated hydroxy anisole (BHA), butylated hydroxy toluene (BHT), tertiary butyr hydroquinone (TBHQ) and propyl gallate.
- Substances like citric acid may be used along with antioxidants in foods as synergists. A synergist increases the effectiveness of an anti-oxiodant but is not as effective an agent when used alone. Some synergists may be effective because of their ability to bind or chelate the metals and prevent them catalyzing the oxidation process. Chelating agents are sometimes called sequestering agents.

14.9 Rendering of Fats

Rendering of fat is the process of melting to extract fat from fatty tissues. A good supply of dripping can be obtained by rendering down suet (fat surrounding the kidney of a cow or sheep) and pieces of fat from meat. This can be done in two ways;

- Cut the fat into small pieces and place in a baking tin in a slow oven until the fat has melted and there are only crisp brown pieces of tissue left. Strain through a fine cloth into a clean basin pressing the tissues to squeeze out all fat.
- Cut the pieces of fat as for above method. Place in a pan without a lid and with very little water. Boil until the water has evaporated and then heat very gently until the fat melts and leaves only crisp brown pieces of tissue. Strain as before.

14.10. Smoking Point

Smoke point of a fat is the temperature at which smoke comes continuously from the surface of the fat. Because fats differ in their smoke points, fats to be used for frying should be chosen on the basis of their resistance to smoking at the temperature used.

Factors that lower smoke point

- The development of free fatty acids by some hydrolysis of the fat during frying causes a decrease in the smoke point.
- A fat that has repeated or prolonged use will begin to smoke at a temperature too low for frying
- Suspended matter such as flour or batter particles also lower the smoke point. And the greater the surface of the fat exposed, the lower is the smoke point.
- Fats heated in shallow wide pans with slightly sloping sides begin to smoke at lower temperatures than do those heated in smaller pans with vertical sides.

In both the cases the temperature should not be too high or else the fat will decompose.

Smoking temperatures of Fats and Oils

Fat / Oil	Smoking Temperature
Butter fat	208
Cotton seed oil	230
Coconut oil	138
Ground nut oil	149-162
Hydrogenated fat	221-232
Lard	194
Olive oil crude	176
Olive oil refined	234
Soyabean oil	230

14.11 Clarification of Fat

Used fat should be clarified and then used for better results in cooking. Strain the used fat and then mix double the quantity of water in a pan and bring it to the boil. Strain again, cool and place it in a refrigerator. The fat will solidify and float on top. Lift the cake of fat, turn it upside down and scrape off the foreign particles that have collected. Heat the fat on slow fire, till the water evaporates and then strain and store it in a cool place.

14.12 Effect of Heat on Fats and Oils

There are three main ways in which the oil decomposes and of all of these pathways lead to a minimization of smoke point and operating temperature. Cooking oil is chemically decomposed in the cooking process and this decomposition leads to a deterioration in cooking quality if the oil is kept in use for a long time.

Oxidation : Reaction of the hot oil surface with oxygen in the air causes molecular breakdown and ultimately the development of rancidity. This change will occur whenever the oil is heated.

Reaction with food residues: Any food fragments left in the oil after cooking will undergo chemical without the residues being removed. Straining the oil after use can help to prevent this type of decomposition.

Hydrolysis: It means that a water molecule reacts with the glycerol part of the fat molecule and causes the fatty acid to break off. Eventually this results in the lowering of the smoking point.

Hydrolysis of fats generally occurs when the fat has been heated. This is because a certain amount of energy is needed to break the bond between the glycerol and the fatty acid. While this is not always the case (bacterial enzymes work well in the cold during the ripening of cheese), for the most part hydrolysis requires some heat. Water, in some form, is also necessary.

14.13 Fat Absorption

From the standpoint of both palatability and ease or rapidity of digestion, it is desirable to hold fat absorption by fried food to a minimum. Generally some 10% oil or fat is absorbed but larger amounts are absorbed in some conditions where the products become soggy and undesirable. Among the factors that affect the amount of fat absorbed are:

- The character and the composition of the food
- The addition of egg to fritter type batter that contains no additional shortening significantly increases fat absorption. Egg yolk contains phospolipids.
- Doughnuts made from soft wheat flours absorb more fat than made from strong flours. The development of gluten by the extensive manipulation of the dough decreases fat absorption as compared with dough in which gluten has not been developed.
- Porous surfaces like bread or fermented foods absorb fat. Surfaces with more cracks, due to under manipulation, absorb more fat.

- Diamond cuts containing a high percentage of sugar and fat absorb more fat while frying than do diamond cuts containing lesser amounts of sugar and fat.
- Addition of sodium bicarbonate to bajji batter causes porousness in the food, which leads to absorption of more oil.
- Greater the surface area more absorption of oil takes place
- If the moisture of the content of the material is higher, the fat absorption is also greater than the control in preparation like pooris and vadas.
- Foods cooked at a lower temperature need to be cooked for a longer period. The longer the food remains in the fat, the greater the absorption of fat.
- When oils are used again and again, the smoking point decreases, free fatty acid content increases and consequently oil absorption increases.

14.14 Role of Fats and Oils in Cookery

- Spreads – butter and margarines are used for spreads, and their function is to add to the flavor, nutritional value and satiety value of breads.
- Shortening – the fats are used to shorten the gluten strands, surround them and make them more easily broken (short) in the making of breads.
- Tempering – fats and oils are used for tempering dals, curries, rice dishes etc.
- Salad dressings – fats and oils are used for making of various dressings like French dressing, vinaigrette dressing etc.
- Fats have textural effects in ice-creams and frozen desserts. They limit the size of water crystals and help in marinating smooth texture.
- Fat interferes with crystallization of sugar, for example in halwa.
- Fat prevents lump formation and brings smoothness. When grains are fried initially while making pulao or upma they get coated with oil or fat and this helps in reducing lump formation and excess gelatinisation and grains remain separated after completion of cooking.
- Fats like ghee is used at the table to improve the flavor and to reduce pungency.
- Butter is spread on bread to increase the palatability.
- Coloring agents like turmeric when added to oil helps in the distribution of color throughout the food.
- Fats tenderize the product and soften the texture
- Fats add moistness and richness to the food
- Fats increase keeping quality, in case of bakery products
- Fats and oils are used for shallow and deep fat frying. Cooking oil is a better heat transfer medium than air and water, in that it heats up very quickly because of its greater specific

heat, and its operating temperature of about 200°C is considerably higher than that of water.

Pan-frying is used to cook dosas, chapathis, omelets and cutlets. Deep fat frying is used in making of pooris, vadas, bajjis, French fries etc. A satisfactory fat or oil for the deep fat frying is one, which is having a high smoking point with no undesirable flavor.

14.15 Conclusion

As you can see, fats are an important ingredient in the kitchen. The selection of the appropriate fat or oil has an affect not only on the product, but on many other issues as well. It is necessary for the culinarians to be extremely familiar with the chemistry of a food to be able to prepare good food? The answer is" No," with qualifications. Because the chemistry of the food does affect the characteristics of the final product in terms of quality (flavor, color, texture) and customer acceptance (quality, value and nutrition combined), culinarians must strive to have at least a minimal understanding of this often ignored facet of our enterprise. This understanding will be gained by staying abreast of the developments in food science, manufacturing, preparation and nutritional application.

14.16 Self Assessment Questions

1. Explain the factors affecting the fat absorption?
2. Define emulsions. Explain types of emulsions with examples?
3. Give a brief notes on rancidity of fats and oils?
4. Explain the role of fats and oils in cookery?
5. Discuss the importance of fat in the kitchen?

14.17 References

1. The Art and Science of Culinary Preparation by Jerald W. Chesser
2. Food Science 3rd edition by B. Srilakshmi
3. Professional Cooking 5th edition by Wayne Gisslen

LESSON 15

Milk and Milk Products

15.0 Objectives:

- To discuss the various types of milk products available
- To discuss cooking with milk
- To define cheese and its role in cookery

Contents

15.1 Introduction

Milk is one food for which there seems to be no adequate substitute. All mammals produce milk after the birth of the young ones and man uses milk of many animals as his food. The cow is the most important of all these animals as supplier of food. Buffalo and goat milk is also widely used all over the world.

15.2 Structure and Composition of Milk

Milk is a complex mixture of lipids, carbohydrates, proteins and many other organic compounds and inorganic salts dissolved or dispersed in water. The most variable component of milk is fat followed by protein.

The composition of milk varies with the species, breed, diet, lactation period and interval between milking. There is an individual variation also.

Milk fat: Buffalo's milk contains 6.5% fat. Cow's milk contains 4.1% fat. Milk fat or Butter fat is of great economical and nutritive value. The flavor of milk is due to milk fat. Milk is a true emulsion of oil-in-water. Fat globules are visible under a microscope. Each globule of fat is surrounded by a thin layer which is composed of a lipid-protein complex and a small amount of carbohydrate. The lipid portion includes both phospholipids and triglycerides.

Milk protein: Casein constitutes 80% of the total nitrogen in milk. It is precipitated on the acidification of milk to ph 4.6 at 20°C. the remaining whey protein constitutes lactoglobulin and lactalbumin. Milk protein contains proteoses, peptones and milk enzymes.

Milk sugar: Milk contains 4-5% carbohydrate. The chief carbohydrate present in milk is lactose, a disaccharide, although trace amounts of glucose, galactose and other sugars are also present. Lactose gives on hydrolysis glucose and Galactose. Lactose has only one sixth the sweetness of sucrose and S! - ¼ of its solubility in water.

Salts: Chlorides, phosphates, citrates, sulphates and bicarbonates of sodium, potassium, calcium and magnesium are present. These salts influence the condition and stability of the proteins, especially the casein fraction. Copper and iron are important in the development of off flavors in milk and milk products. In addition to this, milk contains trace elements like zinc, aluminium, molybdenum and iodine.

Enzymes: Milk enzyme Lipase is responsible for the development of rancid flavors in milk. Bacterial lipase is very resistant to heat and can cause serious quality defects. Lipases may be important in the development of desirable flavors in some cheeses.

Color: White color of milk is caused by reflection of light by the colloidally dispersed casein, calcium and phosphorus. Yellowish color of milk is due to the presence of carotene and riboflavin. Fat soluble carotenes are found in milk fat; riboflavin is water soluble which can be visible clearly in whey water.

Flavor and Aroma: Milk is slightly sweet because of its lactose content. Flavor sensation in mouth is due to fat protein and some of the salts such as calcium phosphate.

Thiamine occurs in only fair concentration in milk, but is relatively constant in amount. Riboflavin is present in a higher concentration in milk than the other B-vitamins and its stability to heat makes milk a dependable source of this vitamin. In cheese making, riboflavin is present in whey water. Since it is sensitive to light, when milk is exposed to sunlight 50% of riboflavin is lost.

15.3 Physical Properties of Milk

: Physically, milk is a dilute emulsion, colloidal dispersion and true solution.

Acidity: Fresh milk has a PH of about 6.5-6.7 at 25°C. as milk stands exposed to air, its acidity decreases slightly because of the loss of carbon dioxide. Raw milk, which normally contains some lactic producing bacteria gradually increase in acidity on storage. Pasteurization destroys lactic acid bacteria.

Viscosity: Factors affecting viscosity of milk are state and concentration of the protein and fat, temperature of milk, age of milk. Conditions and treatments that affect the stability of casein are important in the viscosity of milk such as acidity, salt balance, heat treatment and the action of various enzymes and bacteria. Viscosity depends on the amount of fat, size of the fat globules and the extent of clustering of the globules. Homogenization and ageing increase the viscosity.

Freezing point: The freezing point of the milk is –0.55°C. the freezing point is affected by the soluble constituents, lactose and ash which are constant. This fact makes it possible to determine whether or not milk is diluted. Addition of 1% of water to milk decreases freezing point by –0.0055°C.

Boiling point: Milk boils at 100.2°C at which temperature all organisms are destroyed. The loss of nutritive value of boiled milk is more than compensated by the avoidance of milk borne diseases.

15.4 Various Dairy Products

15.4.1 Milk

- **Fresh whole milk** is what the cow gives naturally. To be termed fresh whole milk the most that can be added to it is vitamin D. Nothing can be taken away. It contains a minimum of 3.25% butterfat (also termed milk fat), 8.5 % non-fat milk solids, and 88% water. It is one of the most nutritious wholesome natural products available.
- **Pasteurized milk** has been heated to kill disease- producing bacteria, then cooled. Most milk and cream products on the market have been pasteurized.
- **Raw milk** is milk that has not been pasteurized. It is not often used and , in fact, is generally not legal.
- **Certified milk** is produced by disease-free herds and kept under very strict sanitary conditions. It may be raw or pasteurized.
- **Homogenized milk** has been processed so that the cream doesn't separate out. This is done by forcing the milk through very tiny holes, which breaks the fat into particles so small that they distributed in the milk.
- **Flavored milks**, such as chocolate milk, have flavoring ingredients and possibly, sugar added. A label such as chocolate milk drink or chocolate-flavored drink indicates that the product does not meet the standards for regular milk. These are best suited for drinking, but not for kitchen use.
- In **Skim milk** fat content is reduced to 0.5 –2% by centrifugation. By removing fat from the milk not only taste or flavor is reduced but fat-soluble vitamins like vitamin A and D are reduced. Usually this milk is fortified with vitamins A and D. Condensed

skim milk finds extensive use in the baking industry and manufacture of confectionery. Skim milk is used for low calorie diets and for children who need high protein.

- **Toned milk** is prepared by mixing reconstituted from skim milk powder with buffalo milk containing 7.0 %fat. The fat content of the toned milk should not be less than 3%.
- **Double toned milk** is prepared by admixture of cow's milk or buffalo's milk or both with fresh skimmed milk or by admixture with skim milk reconstituted from skim milk powder or by partial removal or addition of milk to skim milk. It should be pasteurized. Its fat content should be less than 1.5%.
- **Low-fat milk** has a fat content of 0.5-3%. Its fat content is usually indicated on the label.

15.4.2 Cream: Cream is a form of milk. The fat globules are more concentrated in it than in whole milk. Cream provides a richness and body in items prepared with it that is not readily available otherwise.

- **Whipping cream** has a fat content of 30 to 40%. Within this category you will find light whipping cream (30-35%) and heavy whipping cream (36-40%). Whipping cream labeled ultra pasteurized keeps longer than regular pasteurized cream. Pure ultra pasteurized cream does not whip as much as pasteurized cream.
- **Light cream** also called table cream has a fat content of 16-22%.
- **Half-and-half cream** has a fat content of 10-12%.
- **Crème fraiche** is a slightly aged, cultured heavy cream. It is widely used for sauce making because of its pleasant, tangy flavor and its ability to blend easily into sauces. Unlike regular heavy cream, it usually doesn't require tempering and can be added directly to hot sauces.

15.4.3 Fermented Milk Products: Cooking uses a variety of milk products produced from fermented or soured milk. These add a stronger, more pronounced, flavor to dishes. They also add acid to the dish.

- **Sour cream** is one of the more commonly used products. It has been cultured (bacteria has been intentionally added in order to ferment the product.) or fermented by the addition of lactic acid bacteria to cream. The bacteria grows in the cream and makes acid as a byproduct, giving the cream a tangy flavor and thick texture. Sour cream has about 18% butterfat content. It is used widely in cooking and baking.
- **Buttermilk** is fresh liquid milk (whole, low-fat, or 1%) cultured by the addition of bacteria. It has a rich, thick texture, and a tangy acid taste. It is often used with baking powder to create leavening in baked goods. Buttermilk can be used in recipes calling for soured milk.

- **Yogurt** is milk cultured with special bacteria. The result is a milk product, which has a custard-type texture. Sometimes additional milk solids or flavorings, fruits or sweeteners are added.

15.4.4 Processed Milk Products: Milk is available in forms other than those, which must be kept refrigerated. The ones most commonly used in the kitchen are those from which all or part of the water has been removed.

- **Evaporated milk** can be made form whole or skim milk and contains a minimum of 7.5% butterfat. It has 60% of the water removed. Evaporated milk is sterilized by exposure to high heat and canned. The product has a somewhat cook flavor. It is widely used in baking.
- **Condensed milk** is made form whole milk with 60% of the water removed. The reduced milk is heavily sweetened with sugar and must contain a minimum of 8.5 % butter fat. Condensed milk can't replace other milk products unless the sugar content of the recipe is adjusted.
- **Dried milks** have all moisture removed, creating a powder. They are available as either dried whole milk made from skim milk. The original type of dried milk is called regular. It is not easily dissolved, making it difficult to use. Instant dried milk dissolves more easily and is commonly used in the kitchen.

15.4.5 Butter: Butter is discussed in more than one place in this book. It is both a dairy product and a fat by definition. Butter is composed of 50% butterfat, in some types slightly higher, and the remainder is milk solids and water. Valued as a flavoring agent and lubricant for culinary preparations, butter gives a richness and flavor to foods which is difficult to duplicate. It is one of the most widely used fats in the kitchen.

Most butter in the market is lightly salted. Sweet or unsalted butter is more perishable, but has a fresher, sweeter taste.

Clarified butter, butter from which the milk solids have been removed, is widely used in cooking. Frying or making roux with whole butter is not recommended. The solids in the butter burn far too easily when frying.

15.4.6 Cheese: Cheese is a food produced by separating milk solids from whey by curdling or coagulation. This curdling is brought about by introducing selected bacteria or an enzyme called rennet into the milk. The resulting curds are drained, processed, and cured or aged in a variety of ways.

Processing techniques are so numerous that from a single basic ingredient (milk from cows, sheep or goats), it is possible to produce hundreds of kinds of cheese, from cottage cheese to parmesan, from cheddar to Swiss, from blue to limburger. Variables that produce these differences include the type of milk used, the method of curdling and the temperatures during curdling, the method of cutting and draining the curd, the way the curds are heated, pressed, or handled, and all the conditions of ripening or curing.

Ripening is the process that converts freshly made curds into distinctive, flavorful cheese. This ripening is brought about by certain bacteria or molds that are introduced during manufacture. Much of a cheese's final character is determined by the kind of ripening agent and the way it acts on the cheese.

Cheeses can be classified by the kind of ripening agent and by whether the cheese ripens from the inside or outside.

- Bacteria ripened, from inside – Cheddar, Swiss, Gouda, Parmesan
- Bacteria ripened, from outside – Limburger
- Mold ripened, from inside – Blue cheeses including Roquefort and Stilton
- Mold ripened, from outside – Brie, Camembert
- Unripened – Cottage and Cream

Cheeses are also classified into various categories depend upon their texture – Cream, Soft, Semi-hard, Hard and Blue-vein.

Cooking with Cheese: Cheddar, Swiss and Parmesan are three varieties of cheeses used most widely in cooking. Cheddar is most frequently used especially into sauces. Swiss is used for soufflés, mornay sauce and quiche. Parmesan is used as a grated topping for prepared foods and as a seasoning or flavoring in dishes.

Guidelines for Cooking with Cheese:

- Use low temperatures. Cheese contains a low proportion of protein, which toughens and becomes stringy when heated too much. Sauces containing cheeses should not be boiled.
- Use short cooking times. Cheese should be added to a sauce at the end of cooking. Stirring it into the hot sauce off-heat is usually enough to melt it
- Grate cheese for faster and more uniform melting.
- Aged cheeses melt and blend into foods more easily than young cheeses.
- Aged cheeses add more flavors to foods than young, mild ones, so you need less of it.

15.5 Problems in Cooking Milk and Cream Products

Curdling: Curdling is a process by which milk proteins solidify and separate from the whey. Curdling is usually caused by acids, tannins, salt and heat. The mild acids in many vegetables and the tannins in potatoes are often enough to curdle the milk.

Starches partially stabilize milk and cream. This is why it is possible to make soups and sauces with both milk or cream and acid ingredients. Avoid combining milk or cream with strong acids unless a starch is present.

Reducing temperatures and cooking times also helps. Curdling is more likely at high heat or prolonged cooking.

Scorching: Scorching occurs when milk that is being heated coagulates on the bottom of the pan due to high heat. This deposit is likely to burn if cooking continues.

To avoid scorching, heat milk in a double boiler, steamer, or steam-jacketed kettle rather than over direct heat.

Scum Formation: Scum is formed when milk is heated in an uncovered pan on the surface due to drying out. The scum gets toughened as the temperature is increased. The insoluble scum can be removed from the surface but another one forms. It contains a small amount of coagulated protein, minerals and fat globules.

Scum formation can be prevented by heating or stirring the milk while heating it. Use of a milk boiler helps to prevent it. It can be prevented by covering the pan or by diluting the milk.

Scum formation during the heating of milk is the principle reason for its behavior of boiling over. A certain amount of pressure develops under the scum which later forces this scum upwards and the milk flows over the sides of the pan.

15.6 Role of Milk and Milk Products in Cookery

- It contributes to the nutritive value of the diet, e.g., milk shakes, plain milk, flavored milk, cheese toast.
- Milk adds taste and flavor to the product, e.g., payasam, tea and coffee.
- It acts as a thickening agent along with starch, e.g., white sauce or cream soups.
- Milk is also used in desserts, e.g., ice-cream, puddings
- Curd or buttermilk is used as a leavening agent and to improve the texture, e.g., Dhokla, bhatura.
- Curd is used as a marinating agent, e.g., marinating chicken and meat.
- Curd is used as a souring agent, e.g., rava dosa, dry curd chillies.
- Khoa is used as a binding agent, e.g., carrot halwa
- Milk and curd increase shelf life poories preserve better when the dough is mixed with milk/ curd.
- To prevent browning in vegetables, e.g., butter milk is used for preventing browning when plantain stem is cut.
- It adds Variety of the diet, e.g., avail and mutter paneer
- Cheese is used as a garnishing agent
- Milk is used as clarifying agent in sugar syrup
- Salted buttermilk is used for quenching thirst.

15.7 Points to be remembered in Using Milk and Milk Products in Cookery

- **Prevention of scorching**: Too thin vessels and too high a temperature can scorch the milk at the bottom of the vessel. Use double boiler or stir constantly.
- **Prevention of curdling in fruit milk beverages**: Fruit and milk are cooled thoroughly as high temperature favor curdling.
- **Prevention of curdling in fruit custard**: This can be done by adding ripe or canned fruits, sour fruits like grapes and pineapples may curdle custard. Raw pineapple contain bromelin and may lead to curdling of milk.
- **Prevention of curdling in avial**: For this fresh curds must be used. Increase in acidity favors curdling.
- **Prevention of curdling in jaggery payasam**: Jaggery is to be added after removing from the fire as sometimes the salts present in that may curdle the milk.
- **Prevention of over boiling**: This can be done stirring or by using milk cooker.
- **Prevention of scum formation**: This can be achieved by covering the pan, stirring, using milk cooker, or by adding whipped cream.

15.8 Storage of Milk Products

All butters should be stored tightly wrapped or covered and refrigerated. The flavor of butter is delicate and readily absorbs other flavors. Butter will turn rancid when stored at room temperature. The best temperature for storage is 35°F or below.

Cheeses will change drastically once they are cut. These will also dry out rapidly when exposed to the air. Cheese should be stored in a cool, dark place with good air circulation or in a refrigerator. If it is not covered in its original wrapping, it should be wrapped in either cling film or aluminium foil to prevent any drying out taking place. It should also be stored away from food items that absorb flavor/ odor.

Cold temperatures mask the flavor of cheese. So remove the cheese to adjust to room temperature about one hour before serving, depending on the type and the size of it.

15.9 Conclusion

Dairy products of all types are among the widely used ingredients in cooking and baking. Whether acting as a primary or secondary component in a dish, they contribute in many ways to the character of the finished product. Always, a learner must update with various products available in the market and to what best they contribute to the quality of the foods.

15.10 Self Assessment Questions

1. Describe the different kinds of milk?
2. Describe the role of milk and milk products in cookery?
3. Discuss the points to be remembered while using milk and milk products in cookery?
4. Write a brief notes on cheese. Discuss the role it in cookery?

15.11 References

1. The Art and Science of Culinary Preparation by Jerald W. Chesser
2. Food Science 3rd edition by B. Srilakshmi
3. Professional Cooking 5th edition by Wayne Gisslen

LESSON 16

Egg Cookery

16.0 Objectives

- To introduce Egg as a major ingredient
- To discuss the quality factors associated with purchasing eggs
- To discuss the composition of egg
- To explain the role of eggs in cookery

Contents

16.1 Introduction

Certain foods play a major role in cooking . one of these is egg. It can be served as a main dish, as an accompaniment to other dishes or as an ingredient in an item. Due to versatility, the egg is considered a primary ingredient in culinary preparation, providing moisture, structure and richness in dishes. It is also an emulsifier and aerator when properly handled and used. It is important that the culinarian, must be familiar with this important food source.

In cooking the term ’Egg’, refers to the oval, thin shelled ovum of a bird, used as food. There are many types of eggs such as goose, duck and turkey. Although eggs of all birds may be eaten, the egg of chicken is used more often than any other.

16.2 Structure

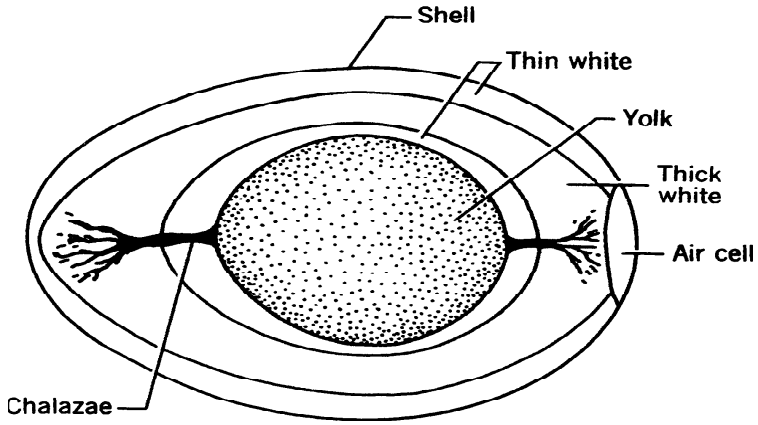
The egg is composed of the shell, white, and yolk or yellow.

16.2.1 Shell: It forms the protective covering of the inner contents of the egg along with the two membranes. Shell is made of protein polysaccharide complex and calcium carbonate. An egg shell is brittle and easily breaks. Some shells are glossy, others are dull. Some may be smooth and others may be rough.

It is porous and contains thousands of small holes which allow gases to pass in and out of the egg for the developing of embryo. The small holes are covered with a thin layer of gelatinous material mucoprotein called cuticle or bloom. The cuticle seals off the pores to some extent and helps avoid an excessive evaporation from the inner contents of the egg. It also restricts the entry of micro-organisms into the egg and thus protects the inner contents from various infections. The cuticle is soluble in water and easily removed by washing which results in hastening the deterioration of egg quality.

16.2.2 Egg white: The white of egg consists of two areas; one thin white encompassing the other area of thick white

16.2.3 Egg yolk: The yolk of the egg is enclosed in a sac called the vitelline membrane. Immediately adjacent to the vitelline membrane the thin membrane that surrounds the egg yolk, is chalaziferous or inner layer of firm white. This chalaziferous layer gives strength to the vitelline membrane and extends into the chalaze. The chalaze appear as two small twisted ropes of thickened white, one on each end of the yolk and anchor the yolks in the center of the egg.



Structure of Egg

16.3 Composition of Egg

The yolk is high in both fat and protein, and it contains iron and several vitamins. its color ranges from light to dark yellow, depending on the diet of the chicken. The white is primarily albumin protein, which is clear and soluble when raw but white and firm when coagulated. The white also contain sulfur.

Vitamin A, B, D are all necessary for health and growth. Iron, phosphorous and calcium are essential for building and maintaining healthy bodies. These furnish all the essential amino acids for building and repairing the body tissues.

Components	Whole egg (%)	White (%)	Yellow (%)
Water	73	86	79
Protein	13	12	17
Fat	12	-	32
Minerals and other compounds	2	2	2

16.4 Grades: In India eggs are graded according to the weight into 4 grades.

- Extra large – more than 60 g
- Large – 53 to 59 g
- Medium – 45 to 52 g
- Small – 38 to 42 g

Clean eggs with unbroken shell are graded on quality depending upon depth of the air cell. Centering of the yolk and free form defects are given grad A and B in India.

16.5 Selection of Egg: The quality of an egg can be judged by considering the following;

- Shell condition
- Size of air cell
- Position of yolk
- Condition of white

16.5.1 Shell: It should be free of feces and generally clean. Rough spots which do not effect the shell strength are permitted. The egg shells must be unbroken. While purchasing, we should consider the strength and porosity of the shell. A high porosity of the shell, will hasten the deterioration of egg quality.

16.5.2 Air cell: As the quality of the deteriorates the size of the air cell increases due to loss of moisture through the cell especially in warm, dry atmosphere. In good quality egg the depth of the air cell is [! - 3/16 inches. In poor quality the depth of the cell would be more than \! of an inch.

16.5.3 Egg white: A fresh egg when broken on to a plate stands up in rounded form due to the viscosity of the thick portion of the egg white that surrounds the egg yolk. As egg deteriorates the percentage of thin white increases.

16.5.4 Egg Yolk: In deteriorated egg the yolk also takes up water from the white and the yolk membrane i.e., vitelline membrane stretches and when broken on to a plate the deteriorated egg flattens and tends to spread over the plate.

16.6 Evaluation of Egg quality

To test the freshness of the egg, plunge it into 12% solution of slated water. If the egg is fresh it falls to the bottom; if the egg is two days it floats mid-way; an egg is 4 days old rises to the surface and a two-week old floats on top.

If the egg sinks down it is considered as good. Poor quality eggs float due to increase in size of the air cell and due to loss of moisture.

16.7 Deterioration of Egg

As soon as the egg is laid, changes begin to take place which, if not checked by suitable storage conditions, result in undesirable deterioration. An account of these changes and their effects are as follows;

16.7.1 Shell: With deterioration, the mucous protective covering of the shell soon disappears, leaving the shell shiny and more porous, so that moisture and carbon dioxide can pass more easily through it from the egg contents. This causes a loss in weight of the egg, a contraction of egg contents, and a resulting enlargement of the air space between the two membranes of the shell.

16.7.2 Egg white: Due to the loss of carbon dioxide through the shell, the egg white changes from nearly neutral fresh white, to alkaline, becoming progressively more alkaline as the egg ages.

16.7.3 Egg yolk: Upon aging, the yolk of egg also becomes more liquid and enlarges as water passes into it from the white through the enveloping vitelline membrane. As a result, the increasing volume of the yolk stretches the surrounding membrane and weakens it so that, in the broken-out egg, the yolk is no longer upstanding and well-rounded, but instead becomes wide and flat.

16.7.4 Off-odors: Finally, in aging eggs certain chemical reactions occur among the various egg components which yield compounds that impart characteristic and familiar off-odors and flavors such as foul-smelling; and if these reactions continue long enough, such eggs become inedible.

16.8 Storage of Egg

Protection of the egg is of great importance. When improperly handled, its properties as an ingredient and independent food item are impaired. Remember that eggs lose quality quickly at room temperature. They should always be stored at 36° to 40°F. An exposure above 55°F shortens the life of the egg. Higher temperatures hasten breakdown of egg white and yolk.

Fresh should be properly boxed. The best packaging for the commercial kitchen is fiberboard boxes. Eggs should be packed in the carton in snug-fitting trays. This will reduce the breakage. Polyurethane cartons are common in the super market.

16.9 Market Forms

Eggs are currently available in a number of forms, which from you will choose will depend upon the intended of the egg. It is common for a large kitchen to have a wide variety of eggs available at all times. The convenience forms may not be suitable for breakfast cookery, yet can save a great deal of labor in other types of cooking and baking.

- **Fresh or shell eggs**: This is the preferred for the most breakfast cookery. In many kitchens fresh eggs are used for all production. Although the fresh flavor is very desirable, for many types of preparation they create extra labor through handling. They also require more storage space.
- **Dried eggs**: These are available as whole eggs, yolks or whites. They are used primarily for baking. Dried eggs are not recommended for the breakfast cookery. This dried product is not shelf stable. Store refrigerated or frozen, and tightly sealed.
- **Frozen eggs**: frozen eggs are usually made from high-quality fresh eggs and are excellent for use in baking. They are pasteurized ones.

  To thaw, place them unopened in refrigerator and hold for two days, or place in a defrosting tank containing running water at 50° to 60°F (10° TO 15°C) for about 6 hours. Do not defrost at room temperature or in warm water.

16.10 Effect of Heat

The basic principle of egg cooking centers around the ability of the proteins in both the yolk and white to coagulate when heated. The rate of coagulation and firmness of the gel depends on the intensity of heat, cooking period and the presence of other ingredients such as milk, water, sugar and salt. Sugar increases the temperature at which coagulation takes place, and acid and salt speed up the process of coagulation.

Extended cooking or high-heat toughens eggs while boiling eggs, if high temperature and long cooking is applied; the iron and sulphur compounds in the white are released to form ferrous sulphide. It is a blackish or purple ring around the yolk. To avoid this, as it spoils the appearance of the eggs, fresh eggs should be used and simmered.

16.11 Methods of Cooking Eggs

- **Boiling**: Lower the egg in boiling water without cracking shells for soft boiled eggs and ten to fifteen minutes for hard-boiled eggs. Cool quickly if it is to be served cold. It prevents the black rim appearing around the set yolk and stops egg cooking.
- **Poaching**: The egg is cooked in simmering water to which a little salt or vinegar has been added to help set the yolk more quickly. Break the egg and lower carefully in the water and use an egg ring to keep shape.
- **Scrambling**: Beaten egg and milk is cooked over a low heat in a little melted butter until set, but not too firm. Stir the mixture constantly to distribute the white and yolk throughout. Add salt after cooking to prevent drying and toughening of the protein.
- **Frying**: Preheat the pan to a moderate temperature and cook the gently to avoid the bottom browning or catching while the yolk remain unset. Never add eggs to a hot pan or the whites will cook quickly.
- **Baking**: Place egg in a ramekin dish, cover with cream to prevent drying. Cook in moderate oven for 6 to 8 minutes.
- **Omelet**: Stir mixture to facilitate even cooking so that the eggs in center and edge cook evenly.

16.12 Uses of Eggs in Cooking

There are few ingredients in food preparation that are useful in s many different ways as are eggs. Used alone or in combination with other foods, they may become the maor protein dish for a meal.

- As a **leavening** by foam formation to make the dish light, as in soufflés or meringues.
- For **binding**, as in egg croquettes.
- Improves **flavour** and **colour** in cakes.
- To decorate and **garnish** dishes.
- To enrich a mixture as in the case of rich cakes.
- As a **thickening**, as in custards and cooked salad dressings.
- For **emulsification**, as in mayonnaise sauce.
- For **coating**, as in fried foods.
- Beaten egg white acts as **interfering substance** in frozen desserts. Tiny bubbles of air trapped in egg prevent ice crystals from coming together and creating large masses of ice crystal.
- Raw eggs can be added to hot broths and coffee. When protein in egg coagulates they trap the loose particles in liquid and **clarify** it.
- In pastries, it gives a golden brown color to the surface when cooked.
- The fat in egg yolks acts as **shortening**. This is an important function in bakery products.
- As the first semi-solid food taken by infants.
- As a nourishing and easily digestible food for invalids.
- As a quick cooking and nourishing dish for breakfast or main meals.
- The protein of eggs, is unexcelled in quality, and is used as a standard against, which other food proteins are measured.
- Eggs make a substantial contribution of vitamins A and D and also contain a small amount of B complex vitamins and minerals.
- The essential fatty acids are more finely emulsified in eggs than in any other food thus assuring easy, complete digestibility and ready utilization.

16.13 Conclusion

The egg is unquestionably one of the best food sources, yet it requires thought and consideration. As a culinarian, your goal must be to make the best possible use of ant food source. In the case of egg this means handling it properly to protect against bacteria growth and nutritional degradation. It also means choosing how, and in what manner, to use it nutritionally.

16.14 Self Assessment Questions

1. Draw the structure of egg and explain the uses of it in cookery?
2. How do you assess the quality of eggs?
3. List the points to be considered while purchasing eggs?

16.15 References

1. Theory of Cookery by Krishna Arora
2. The Art and Science of Culinary Preparation by Jerald w. Chesser
3. Book of Ingredients by Phillip Dowell Land Sydney
4. Food Science 3rd edition by B Srilakshmi

LESSON 17

Fish and Shellfish

17.0 Objectives

- To explain the classification of fish with examples
- To identify the cuts of fish
- To discuss the selection of fish and shell fish
- To state the methods of cooking fish

Contents

17.1 Introduction

Fish provides many attractive and satisfying dishes. Fish is a high protein food, supplying on an average a little more than 5 gm of protein per edible ounce.

Fish and Shellfish are one of the most popular foods consumed all over. The taste, cooking and last, but not least, health consideration have made many people prefer seafood more compared to meat and poultry and consequently there is a considerable increase in the consumption of seafood.

Fish could be got from lakes, river and sea. Freshwater fish are considered to be the superior in flavour to salt water fish. As fish plays a very important role in the culinary preparations, since it has got very delicate proteins and important minerals, it is a highly perishable commodity, which can't withstand high temperatures. If the fish is obtained from contaminated waters, the bacterial growth will be rapid and it turns stale.

More than 2000 species of fish are there in the waters of the world, out of which 50% are unacceptable for commercial use. Only about a dozen different species appear in the American

and European markets. Around 60 species appear Portuguese and Japanese markets; around 200 types are on sale throughout the year in the English market. Europe mainly prefers fish like Cod, Hake, Herring, Mackerel, Pilchard and Anchovy. American demand is mainly for Salmon, Flounder, Cod, Halibut, Trout, Perch and Bass.

The transport of flowers through refrigerated air carriers in the 1960's brought about a change in the fish industry. In the year 1969, for the first time, fresh fish were transported through air. This made fresh fish available anywhere a jet could fly. Another important development in the fish industry is AQUACULTURE. Literally, it means the cultivation of the natural produce of water.

17.2 Composition of Fish and Shellfish

Due to the availability of large varieties of fish and shellfish, at any given point of time, it makes the selection and preparation of them both exciting and in some ways confusing. It makes the job of a chef more demanding, as he/she needs to understand the differences in TASTE, TEXTURE AND BONE STRUCTURE of various kinds of fish.

Fish are valuable, not only because they are a good source of proteins, but because they are suitable for all types of menus and can be cooked and presented in a variety of ways. This range of different types of fish of varying textures, taste and appearance is indispensable to a creative chef.

The composition of fish varies reflecting to a large extent its variable fat content. In fish such as cod, haddock, whiting, rock fish and sole, the amount of fat content is less than 1%. In salmon, mackerel and butter fish the fat content is as high as 25%. The protein content of fish is approximately 20% and the mineral content is about 1.5%. The shell fish has less fat content and more carbohydrate than fat fish. Like meat, fish contain some glycogen in muscle tissues. In the live fish, glycogen is the source of stored energy. Oysters are notable for their high content of glycogen, on an average of 2 to 3%.

Fish is rich in calcium particularly small fish when eaten with bones. Marine fish is good source of iodine selenium and fluoride. Oysters are good source of copper and iron. Sodium content of fresh water fish is slightly less than meat.

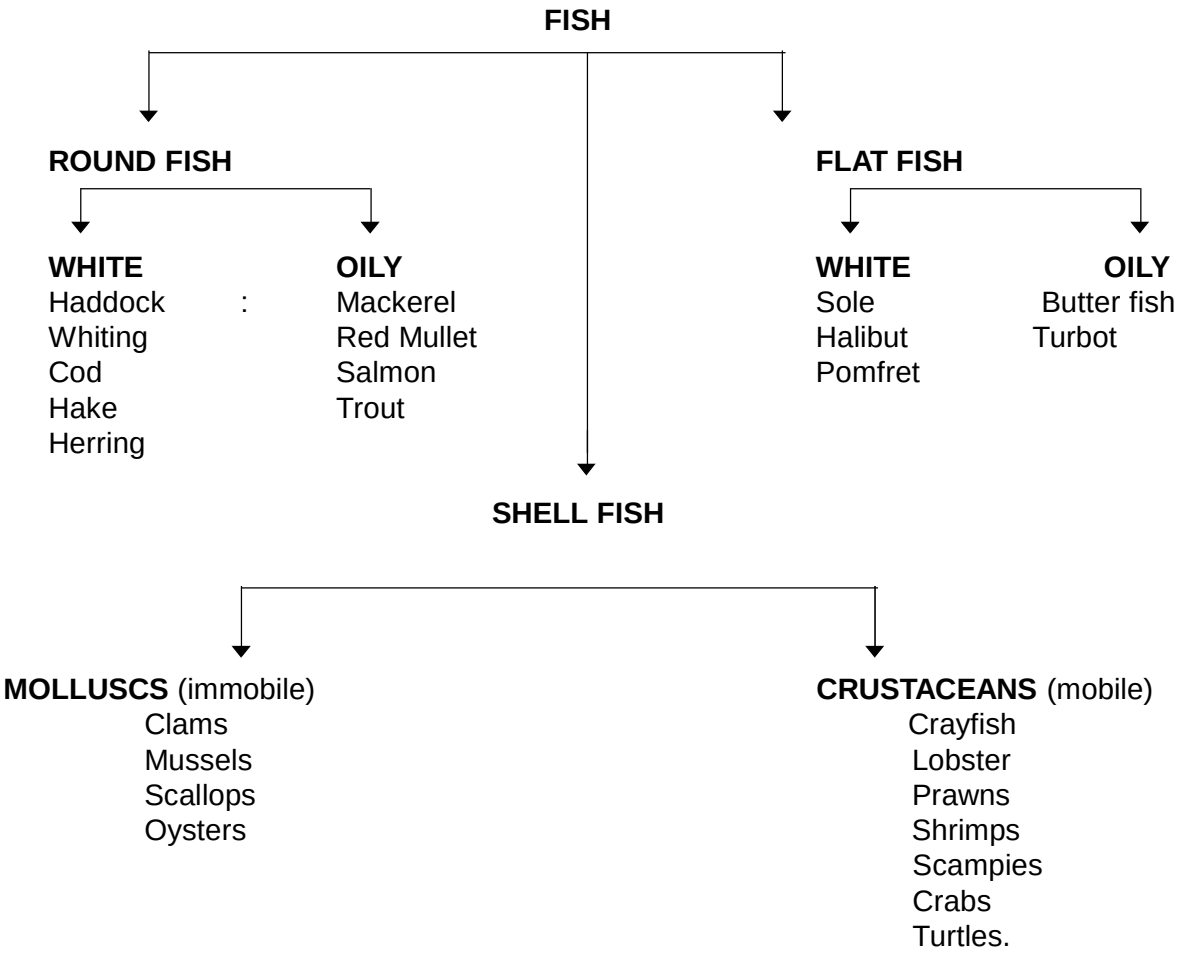
Sea foods contain significant amounts of Vitamin B12 especially shell fishes. Fish liver oils are excellent source of fat soluble vitamins. Shark liver oil contains 10000 – 24000 IU of vitamin A per gram of oil. Rohu contains vitamin C. fish are rich food source of niacin and Vitamin D

17.3 Varieties

Fish and Shellfish can be divided into two different categories according to the source of availability as:

- Sea fish (Deep Sea, Shallow Sea)
- Fresh water fish (Ponds, Lakes, Rivers)

For the Culinarians, fish are classified into two main groups:



Shellfish are fish covered with a hard shell to protect their delicate flesh.

17.4 Selection of Fish

It is very essential to buy very fresh fish from the market, because spoilt seafood is very dangerous to consume. The following points must be considered while selecting fish;

- Eyes must be bright and unsunken
- Gills should be red
- The tail should be stiff
- Scales should be plentiful
- The body should be rather heavy in relation to the length of the fish
- A stale fish will leave the finger impression if it is pressed
- Raw flesh should not come out of the bones, as it is the sign of deterioration.

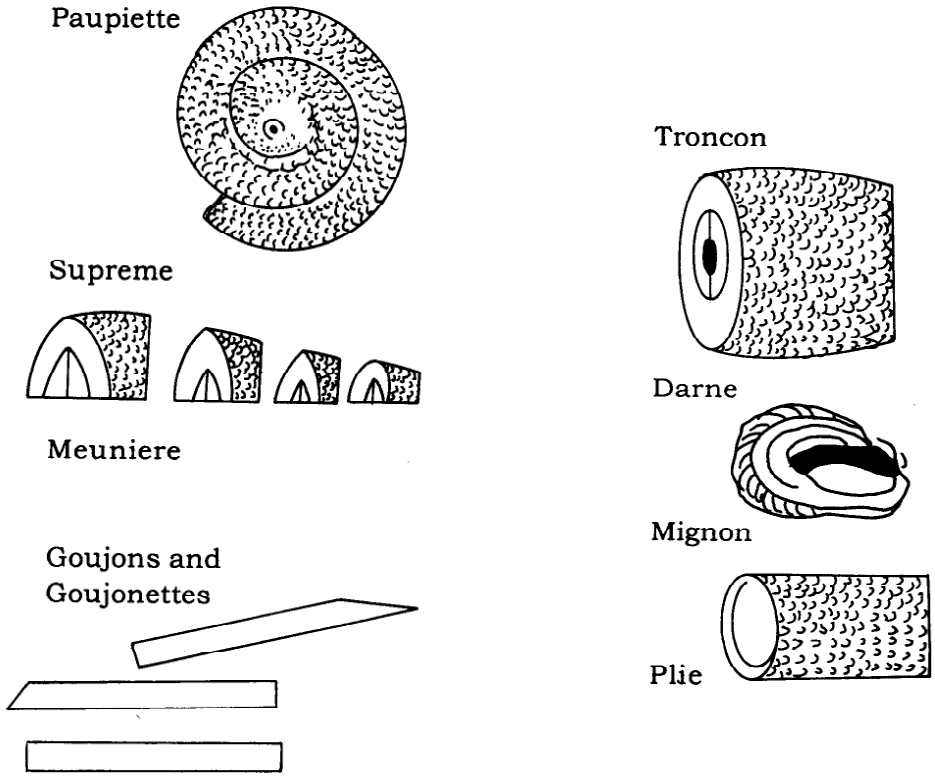
17.5 Preparation of Fish for Cooking

- Soak the fish for few minutes in cold water before descaling
- Use the blunt side of the knife to de-scale
- Hold the head of the fish with the left hand. In the right hand, hold the knife in vertical position; scrape from the tail side towards the head.
- Cut off the fins, remove head. The entrails should be removed by cutting the fish lengthwise on the belly side.
- If the fish is slippery, apply salt to the hands and hold the fish to have a good grip.

17.6 Cuts of Fish

The preparation of fish for cooking is carried out in the Larder. In large kitchens, it is done by Chef Poissonier or Fish Mongery. The various cuts are:

- **Fillet**: This is the flesh of the fish removed completely from the bone in long flat pieces. Flat fish yields 4 fillets and round fish yields 2 fillets.
- **Supreme**: Large fillets of fish cut on slant of large round or flat fish. Ex: Supreme of Turbot.
- **Paupiette**: This is a small fillet of fish spread with stuffing and rolled up, and tied with strings.



- **Goujons or Goujonettes**: Strips of fish approximately 8 cm long by 1 cm wide cut from the fillets of fish. Goujonettes are smaller in size and are used for garnishes.
- **Troncon**: It is a thick piece of fish 4-5 cm thick, cut on the bone from a flat fish like Turbot.
- **Darne**: A piece of fish cut across and through the bone of large, whole round fish such as Cod, Salmon, which is 2-3 cm thick.
- **Mignon**: Fillet of fish folded as a colnel
- **Plie**: Fillet flattened and folded into two.

17.7 Methods of Cooking Fish

The cooking of all poached, braised and shallow fried fish and any fish stews is the responsibility of the Chef Poissonier. Deep frying and grilling of fish is the responsibility of the Chef Rotissier.

17.7.1 Boiling: Whole fish should be cooked by placing in cold liquid bringing to the boil and barely simmering till cooked. Cuts of fish should be placed in simmering liquid; this prevents escaping juices from coagulating into a white coating on the cut surfaces. After reboiling and skimming, the liquid should barely move; a temperature of 95 C is sufficient.

It is inadvisable to boil fish rapidly as this damage the texture and shape of the flesh. Thus, the principle involved more closely approximates true poaching. In fact, the French term of boiling “bouillir”, is seldom used in conjunction with fish. “Pocher” is the most widely used term, e.g., Darne de Saumon Poche. Fish may be poached in deep or shallow liquid. After deep poaching, it is usual to serve the fish with lemon, plain boiled potatoes, picked parsley and a suitable sauce. Fish is shallow poached when it is to be covered with a sauce. It should be barely covered with a liquid and cooked in a moderate oven. The cooking liquid is invariably utilized for finishing the cooking sauce.

17.7.2 Braising: Round oily fish such as Salmon, may be braised. E.g.Darne de Saumon Chambord.

17.7.3 Baking: Round white fish may be stuffed with forcemeat or stuffing and baked in the oven using butter. Whole flatfish such as Sole may be baked by the “au gratin” method.

17.7.4 Grilling: Most cuts and types of fish are suitable for grilling. They are seasoned, floured, brushed with oil and cooked over heat on the grill or placed on a tray to be grilled under the salamander. Grilled fish should be garnished with lemon and parsley and accompanied with a suitable sauce or butter.

17.7.5 Stewing: There are number of French regional fish stews using a mixture of different fish, of which the best known is Bouillabaisse a la Marseillaise. The usual method is to cook the pieces of fish with vegetables, herbs and seasonings in water or Fumet de Poisson and without thickening the stew.

17.7.6 Shallow Frying: Whole small round and flatfish, troncons, fillets and supremes of larger fish are suitable for shallow frying. The term “Meuniere” is used to denote fish cooked by this method. The fish is passed through flour and then shallow fried in oil or clarified butter. Fish Meuniere is finished with slices of lemon, lemon juice, brown butter and chopped parsley.

17.7.8 Deep Frying: Whole small round and flatfish, supremes, fillets and goujons are suitable for deep-frying. Fish must be coated before deep-frying using one of the following combinations.

- Flour, Egg wash and breadcrumbs
- Milk and Flour
- Flour and Butter
- Flour and Beaten eggs.

Deep fried fish should be served garnished with lemon, parsley and accompanied with a suitable sauce, e.g., Sauce Tartare or Sauce Remoulade.

17.8 Storage of Fish:

- Fresh fish are stored in a fish-box containing ice, in a separate refrigerator or part of a refrigerator use only for fish at a temperature of 1°-2°C (34°-36°F).
- The temperature must be maintained just above freezing point.
- Frozen fish must be stored in a deep-freeze cabinet or compartment at -18°C (0°F). When required, frozen fish should be thawed in a refrigerator.
- Smoke dish should be kept in a refrigerator.
- To avoid the risk of cross-contamination fish should be stored in a separate refrigerator away from other foods; cooked and raw fish are kept separate.

17.9 Shellfish

Another variety of sea delicacies is shellfish, which as the name suggests are fish with a hard shell cover to protect the delicate flesh. These have only external shell but no internal bone structure. These are again classified as:

- **Mollusks:** These are soft sea animals that fall into three categories again:
  - Bivalves, which have a pair of hinged shells such as clams, and oysters.
  - Univalves, which have a single shell such as abalone and conch.
  - Cephalopods such as octopus, squid and cuttlefish
- **Crustaceans:** Are animals with segmented shells and jointed legs. Examples include Lobsters, Shrimps, and Crabs etc.

Selection of Shellfish:

- Freshness in shellfish can't be recognized by brightness of the eyes and stiffness of flesh and tail.
- Claws, when pulled should spring back and both the claws should be attached
- They should be heavy in proportion to their size in case of lobster and crab.

- Buy shellfish alive to ensure freshness.
- They should smell fresh and sweet. A strong fishy or iodine smell indicates age or spoilage.

Storage of shell fish

- Fresh fish are stored in a fish-box containing ice, in a separate refrigerator or part of a refrigerator use only for fish at a temperature of 1°-2°C (34°-36°F).
- The temperature must be maintained just above freezing point.
- Frozen fish must be stored in a deep-freeze cabinet or compartment at -18°C (0°F). When required, frozen fish should be thawed in a refrigerator allowing sufficient slack time.
- To avoid the risk of cross-contamination fish should be stored in a separate refrigerator away from other foods; cooked and raw fish are kept separate.

17.10 Conclusion

Preparing fish and seafood requires a working knowledge of the characteristics of the types available. This is an ongoing, never ending endeavor, since, as the common varieties becoming scarcer, new varieties are brought to market to replace them. This presents the great challenges to the culinarian. The new varieties require experimentation to determine the most suitable cooking method of each. Farm raised products often have flavors and textures somewhat different from their wild counterparts, again requiring consideration in selection of preparation method. Nutritional concerns increasingly direct culinarians toward innovative preparation techniques and rethinking of traditional cooking methods.

17.11 Self Assessment Questions

1. Write short notes on selection of fish?
2. Discuss the cuts of fish neatly drawn diagram and their uses in detail?
3. Classify fish and shellfish with help of neatly drawn chart?
4. Give short notes on shellfish?

17.12 References

1. Theory of Cookery by Krishna Arora
2. The Art and Science of Culinary Preparation by Jerald W. Chesser
3. Professional Cooking 5th edition by Wayne Gisslen
4. Food Science 3rd edition by B Srilakshmi

LESSON 18

Poultry and Game

18.0 Objectives

- Defining poultry and the kinds of birds included in this grouping
- Explaining Criteria for choosing poultry
- Discussing various cuts of chicken
- Introduce and discuss various varieties of Game birds
- Discuss the storage and handling of Poultry and Game

Contents

18.1 Introduction

All domestic birds prepared in today's kitchens are termed poultry. This includes chickens, turkeys, ducks, geese, guinea hens and domestic pigeons (squab). Chicken are descended from the jungle fowl Gallus Bankiva of the pheasant family Phasianinae. These birds were bred in the Indus valley 4,000 years ago. Records show that the farmers of ancient Mesopotamia bred duck. Geese were bred in Germany as early as 1000 B.C

Over the years, poultry farming has developed greatly. The demand for selective breeding for meat and eggs has lead to automated production techniques. Today, poultry is more popular than the meat from any other animal or bird.

The versatility, the popularity, and the relatively low cost of popularity items make them ideal for all kinds of food service operations, from elegant restaurants to cafeterias and fast-food restaurants. Also, chicken and turkey are lower in fat and cholesterol than other meats.

Game birds, such as pheasant, are also increasing in popularity and availability because many producers now raise them domestically. Farm-based game birds are similar, in many ways, to chicken.

18.2 Composition and Nutritive Value

Poultry meat has a high protein content about 25 percent and is comparable in quality and nutritive value to other meats. It contains all the essential amino-acids required for building body tissues. There is little fat on the meat of young birds, but the fat content is influenced by age and species of poultry.

Chicken fat is more unsaturated than the fat of red meat and this has nutritional advantage. Like other animal tissue, poultry flesh is a good source of B vitamins and minerals.

The dark meat of chicken is richer in riboflavin than the light, but the light meat is richer in niacin.

Because of its high protein to fat ratio, poultry meat is advantageous to persons who must restrict the intake of fats.

18.3 Varieties of Poultry

Kind	Description	Age	Preparation
Chicken			
Spring Chicken	Special breed of young chicken, very tender and delicate	5-6 weeks	Roast, braise, casserole
Broiler or Fryer	Young chicken of either sex. Tender flesh and flexible cartilage. Smooth skin	9-12 weeks	Broiled, fried, roasted, braised, casserole

Roaster	Young chicken of either sex. Tender flesh, smooth ski9n, less cartilage	3-5 months	Roast, braise, stew, boil
Capon	Castrated male chicken. Flesh very tender, well flavored, large breast, expensive	Under 8 months	Roast
Hen or Fowl	Mature female, tough flesh, coarse skin, hardened breastbone cartilage	Over 10 months	Boil, stew, fricasse
Cock / Rooster	Mature male, coarse skin, tough dark meat	Over 10 months	Boil, stew, fricasse
Turkey			
Fryer/ Rooster	Young bird of either sex. Tender flesh, smooth skin, flexible cartilage	Under 16 weeks	Stew, boil, roast
Young Turkey	Bird with tender flesh, firmer cartilage	5-7 months	Roasted
Yearling Turkey	Fully matured bird, still reasonably tender	Under 15 months	Roasted
Mature Turkey or Old Turkey	Old bird, tough flesh, coarse skin	Over 15 months	Roasted
Duck			
Broiler/ Fryer Duckling	Young tender bird, softbill & windpipe	Under 8 weeks	Roast, spit, broil
Roaster duckling	Young tender bird with bill & windpipe just starting to harden	16 weeks	Roast, spit, broil

Mature Duck	Old bird, tough flesh, hard bill & windpipe	Over 16 weeks	Roast, spit, broil
Guinea			
Young Guinea	Young birds are tender	About 6 months	Roasted
Mature Guinea	Older ones are tougher	Up to 12 months	Roasted
Goose			
Young goose	Tender flesh	Under 6 months	Roasted
Mature goose	Tough old bird	Over 6 months	Roasted

18.4 Selection Criteria for Chicken

1. Soft fluffy feathers should be all over the body, especially concentrated under the wings.
2. The quills of the feathers should be easy to pull out.
3. The eyes should be prominent and clear
4. It should not have a marked unpleasant smell.
5. The feet should be supple with smooth overlapping scales, and if fresh, moist.
6. Combs and wattle (the skin hanging near the beak) should be small and well developed. The comb being bright red.
7. Conformation or the shape of the bird is important, and the bird should be free from deformity.
8. Should not have marked unpleasant smell
9. The skin should be clear and smooth with no bluish tinge spots

Selection Criteria for Other Birds:

- **Turkey** : The breast should be plump, the wattle red.
- **Duck** : the breast should be plump. The bill and feet are yellow in young birds, but they are darken with age. The webbing of the feet should be smooth, tender and easily broken and the under bill soft and pliable.
- **Goose**: the legs should be smooth and the breast plump. Feet should be yellow and smooth, an webbing should be easily torn.

18.5 Dressing a Chicken

After the birds are bled they are scalded, that is, dipped in hot water briefly. The temperature of the scald water may be 60°C and the bird is kept in it for about 45 seconds or more safely with less chance of the outer layer of the skin (cuticle) removal at 52°C for 2 minutes. Scalding loosens the feathers on the chicken and thus helps defeathering.

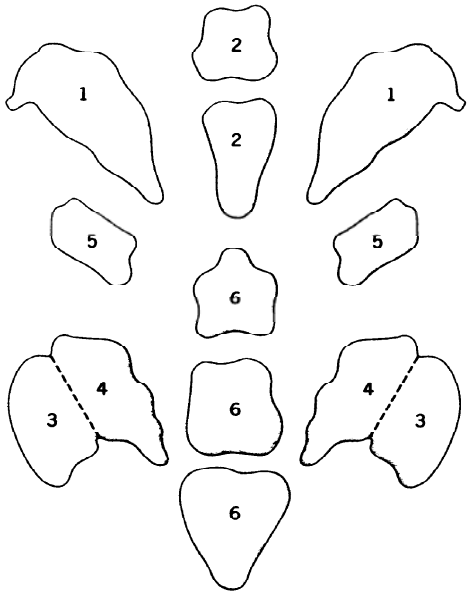
After defeathering, evisceration of the bird takes place. The eviscerated birds are thoroughly washed and chilled.

Rapid chilling to 1.7°C is essential to control the growth of bacteria which contaminate the flesh once the skin is broken. Cooling is also necessary from the point of view tenderness of meat.

The graded poultry is individually packed in low-moisture and low oxygen transmission film or bags. Before sealing the packs, care is taken to expel the air between the carcass and the bag. The sealed bags may be stored under refrigeration of frozen. Refrigerated poultry has a shelf life of only a few days (6-10 days), frozen poultry, at -23°C to -18°C may be stored up to 9 months.

18.6 Cutting of Chicken

- Remove the feet at the first joint
- Remove the legs from carcass
- Cut each leg in two at the joint
- Remove the wish-bone. Remove the winglets and trim
- Remove the wings carefully, leaving two-equal portions on the breast
- Remove the breast and cut in two
- Trim the carcass and cut into three pieces.



Cuts of Poultry

English Cuts	French Name
1. Drumsticks	Pilon de cuisse
2. Thighs	Gras de cuisse
3. Winglets	Aileron
4. Wings	Aile
5. Breast	poitrine or Blanc
6. Carcass	Carcasse

18.7 Storage of Chicken

Fresh poultry is extremely perishable. It should arrive packed in ice and be kept in ice until used. Ideally, use fresh poultry within 24 hours of receiving. Never hold it for more than 4 days.

Store frozen poultry at 0°F (-18°C) or lower until ready to thaw. Thaw in an original wrapper in refrigerator, allowing 1 to 2 days for chicken, 2 to 4 days for larger birds. If pressed for time, thaw in cold, running water in original wrapper. Do not refreeze thawed poultry.

Poultry left-overs (meat, stuffing, broth and gravy) should be refrigerated immediately and stored not longer than 1 to 2 days. The use of moist dressing and the difficulty in quickly reducing the temperature of left-over parts increase the chances for multiplication of salmonella. Left-over stuffing should always be removed and refrigerated or frozen separately

18.8 Cooking Methods

The methods used for poultry depends upon the size of the bird and the nature of the flesh. Some birds are young, tender and lacking in fat, others are tough and require moist heat for tenderizing. Older fowls have richer flavor to impart to soup and creamed dishes than young chickens. The characteristics of the flesh have led to special methods of preparations for the specific classes of poultry. Young birds are cooked by grill, tandoor or roasted as they are tender.

The four basic methods of preparing young birds are broiled, fried (pan, deep or oven), sautéed and roasted. The three basic methods of preparing older birds are stewed or fricasseed; poached or boiled, and steamed.

Whatever cooking method is chosen, care must be taken by the culinarians not cause a loss of natural juices and dry product. This is particularly important for whole roasted birds. When it is necessary to use a fork it should be stuck into the back or between the drumstick and the breast. Checking the internal temperature of a cooked bird with a thermometer is best done in the thigh. This not only protects the breast of the bird, but provides an accurate reading of a temperature representative of the whole bird.

18.9 Trussing a Chicken (for Roasting)

The legs are blanched in boiling water for a few seconds and the scales removed with the aid of a cloth. The claws are trimmed. To facilitate carving, the wishbone is removed. The bird is then trussed, using two strings. The trussing needle is a strong steel needle about 6" long with a large eye. Thread the trussing needle and pass it through both the thighs and then through the

wing, the neck, which has the skin covering the neck opening, and then through the other wing and tying both the ends of the string securely. The winglets should be crossed over the breast. A second string is passed over the legs and under the white breast and secured leaving the prepared legs protruding beyond the rear of the chicken.

18.10 Accompaniments and garnishes for Chicken:

Grilled Chicken	Fried straw potatoes, piquant or devilled sauce
Tandoori Chicken	Onion rings, lemon and green chillies
Chicken Khorma	Chopped green dhaniya and fried cashew nut slices.
Chicken Curry	Chopped green dhaniya and juliennes of ginger
Roasted Chicken	Bread sauce, game chips, water cress, roast gravy, parsley and thyme stuffing
Chicken Maryland	Banana fritters, corn galettes, fried parsley

18.11 Game

Humankind became meat eaters by first killing and eating smaller animals and birds. We eventually devised ways to kill those bigger than over selves. Finally we advanced to the point of domesticating certain types of animals and birds. These were raised in a more controlled manner, closer to humans. By doing this we created a food source which could be gathered without having to roam large areas and with less danger to a degree the type and character of meat which we eat. Although today we value highly the meat of domesticated animals and birds, the desire remains to enjoy the flavor of what is termed game.

The word Game, for culinary purposes, means birds and animals hunted for food. Many of these, such as pheasants, partridges, quails and rabbits, are now reared domestically, yet are still classified as game.

The game used in the kitchen today is divided into two types namely Feathered and Furred. Whether feathered or furred, game differs from domesticated animals because of its meat. The meat of game is generally darker, stronger tasting and often tougher. These characteristics increase with the age of game. It is also more pronounced in some game than in others.

18.12 Varieties of Game

Kind	Age	Preparation
Pigeon regular	28 days	Roast
Pigeon jumbo	28 days	Roast
Partridge	18 weeks	Roast, braise, casserole
Quail	12-14 months	Roast, braise, sauté, broil
Pheasant		
Baby	8-10 weeks	Roast, braise
Broiler	10 weeks	Roast, braise
Mature cock	20-22 weeks	Roast, braise
Mature hen	20-22 weeks	Roast, braise
Wild Duck		
Mallard	6 months	Roast, broil, braise
Teal	6 months	Roast, broil, braise
Wild Turkey		
Mature hen	6 months	Roast, smoke
Mature Gobbler	12 months	Roast, smoke
Furred Game		
Bear		Roast, braise, sauté
Boar		Roast, sauté, barbequed
Deer		Broil, grill, roast
Hare		Roast, casserole, stew, paté
Rabbit		Stew, sauté

- **Pigeon** : A domesticated or wild bird of which several species are eaten as game. Pigeon has been a popular dish since the middle ages of especially served with peas.
- **Pheasant**: It is a long-tailed game bird introduced into Europe from Asia in the early middle ages. The young pheasant can be distinguished from an old bird, by the first wing-tip feather, which is pointed in a young bird and rounded in an old one.

- **Partridge**: A highly prized game bird, which is hunted throughout the Europe. In France, the word Perdreau is used for Partridges of either sex upto the age of one year.
- **Quail**: A small migratory game bird found in Europe, in flat open country, from April to October. In the autumn the bird is plump, round and its flesh is full of flavor.
- **Bear**: A large four - footed game animal. Bear meat has a musty taste and should be marinated for longer time.
- **Venison** : The meat of any animal the deer or Cervidae family is called Venison. Unless, the animal is young, it needs to be hung and marinated. The best meat is taken from the buck in its second year.
- **Rabbit** : The meat of rabbits is generally tender, light and delicate. It closely resembles chicken in flavor and texture. Rabbit does not need to be hung.
- **Hare** :Hare though belonging to the same family as rabbits, are gamier. They are also larger. Their flesh is darker and has a strong flavor.

18.13 Selection Criteria for Game Birds

When buying young birds look for clean, soft textured feet, pliable breast bones and round spurs. When game animals, keep in mind that the ears of young hares and rabbits split easily and soft textured.

18.14 Preparation Tips for Game

Game meat, as a rule, responds best to roasting. Young game birds, in particular, should be roasted, and traditionally are left unstuffed. In practice, however, large birds, such as pheasant may be stuffed with seasoned ground beef. This will help keep the flesh moist. Older, tougher game should be cooked in a casserole, braised or made into pies, pates and terrines. Marinating game meat in a mixture of oil, vinegar, wine or beer, with herbs and spices will help make tough meat tender and enhance its flavor.

18.15 Storage

Game meat should be refrigerated, like other meats. If it is uncooked, cover or wrap tightly. For the best flavor, use the meat within three to four days. Before storing venison, in particular, the fat should be trimmed. The characteristic venison seems concentrated in the fat, for this reason it should be completely trimmed to reduce strong flavor.

Deer and birds must be hung before freezing. No amount of hanging after they have been frozen will help. You should freeze only high quality meat. Remember that maximum storage time for game is less than that for am meat from domesticated animals. For best eating, game should be used within four months.

Game, such as venison, is best frozen in small packages. These will freeze and thaw faster. Label all packages with name of product, date frozen and its weight. You should cook frozen and thawed game as you would fresh game.

18.16 Conclusion

The future of poultry is very promising. It is an expensive, high quality protein supply. Naturally low in fat and calories, it has a secure place as a choice of the nutrition-conscious eater. Turkey has perhaps the brightest future. Production techniques continue to improve, providing a year-round source of protein. Ham, hot dogs and pastrami made from turkey are only a few of the products becoming widely accepted by the public. The improved breeding of ducks are creating a duck which has less fat and more breast meat. Improved handling and processing is resulting in more tender, moist duck with improved flavor. There will be a much wider selection of poultry to choose from in the future with a greater degree of customer acceptance.

Although game is not something served in every establishment or cooked in every kitchen, it is an important part of a future chef's learning experience.

18.17 Self Assessment Questions

1. How do you truss a chicken for roasting?
2. Why is poultry considered a good choice as nutritional meat?
3. Define poultry and state the types of birds included in this grouping?
4. List the factors to be considered while selecting Poultry and Game?
5. List the various cuts of poultry with neatly drawn diagram?

18.18 References

1. The Art and Science of Culinary preparation by Jerald W. Chesser
2. Theory of cookery by Krishna Arora
3. Food Science 3rd edition by B. Srilakshmi

LESSON 19

Meat Cookery

19.0 Objectives

- To explain the concept of meat cookery
- To discuss the physical and chemical composition of meat
- To discuss various meat and meat related products
- To discuss the selection of different meat products
- To identify various cuts of beef, veal, lamb and pork

Contents

19.1 Introduction

The term meat is generally applied to butchery meat- beef, veal, lamb and pork. Meat also includes the glands and organs of these animals. Meat products include many of the by-products from animal slaughter such as animal used for sausage casings, the fat in the manufacture of lard, gelatin and others.

19.2 Structure and Composition of Meat

In order to cook meat properly, it is important to know the composition and structure of the meat.

The composition of meat, whether from beef, veal, calf, sheep, lamb or swine, has both physical and chemical characteristics. The physical characteristics are muscle tissue, adipose tissue (commonly termed fat), and bone (skeletal) tissue. The chemical characteristics consist of water, protein, fats, carbohydrates, mineral and vitamins.

Muscle: The muscle of the animal is divided into three types namely skeletal, cardiac and smooth. Of these types, it is the skeletal muscle which makes up the majority of the muscle weight on the carcass. Skeletal muscle is muscle tissue which is attached directly or indirectly to bone. It gives support to the skeleton and assists in movement.

The cardiac muscle, as its name implies, is what forms the animal's heart. This muscle differs in composition from skeletal muscle. The smooth muscle is found in the stomach, reproductive organs and circulatory system of the animal.

Coarse, long muscle fibers yield a less tender meat. The thinner, smaller muscle fibers are more tender. Muscles located along the shoulders and legs, which are used for movement, will have more connective tissues and are less tender. The muscles in the back are for support and move less. They will yield a more tender meat.

Adipose Tissue: Adipose tissue commonly termed fat. It is known that as the animal ages the concentration of the fat increases if the animal is well fed. The amount of fat in the carcass is affected by the feeding and handling of the animal and by genetics.

When the animal first begins to gain fat it is deposited internally around the organs of the body and in the pelvic area. As the animal continues to age, fat is deposited externally, just under the skin. This is often called finish. Additional fat begins to be deposited between the muscles (seam fat) and within the muscle (marbling).

Marbling, the fat contained within the muscle, is a factor in the preparation of meat. It has a large effect on the juiciness, flavor and, to a lesser extent, tenderness of prepared meats. This type of fat lies between the muscle fibers. Well marbled beef generally tastes better and is usually more tender than beef with little marbling.

Bone (skeletal) Tissue: Skeletal tissue consists of the ligaments, tendons, cartilage and bone of the animal. The skeletal tissue of the animal which forms bones is termed as ossified. The cartilage within the animal also ossifies as the animal matures. It is this process of bone formation which is used as another factor in grading veal, calf, lamb, and mutton carcasses.

It should be remembered that, although ossified (changed in to bone), the bone is still living tissue. It is the tissue of the bone which yields many of the nutrients and minerals of the carcass, but is less often consumed, unless extracted in stock. Ligaments, tendons and cartilage yield little or no food energy, (calories). The bone of the animal can supply certain minerals (especially calcium and phosphorous) if extracted correctly, as in stock. The bones used to make stock yield food energy from the fat contained in the bone marrow.

Water: Water content of the muscle tissue of the animal affects flavor, color and texture of the meat. There is a wide variance between the amounts contained in animals of different ages.

The muscle of veal may contain as much as 72 percent, while that of mature beef contains as little as 45 percent. Hoe the meat is handled can affect the amount of water it retains. Grinding, chopping, cutting, and exposure to heat, salt or acidity can all change the moisture content of the meat.

Protein: Collagen is the protein found in greatest quantity in the animal, composing up to 20 to 25% of the animal's total protein. The primary function of the collagen in the animal is to provide strength and support. It helps to form the skin of the animal. Collagen plays a part in the tenderness of the meat. It is readily broken down in cooking with the moist heat. This white, thin, semitransparent protein contracts and softens into a mass during cooking. This provides the cooked meat with a plump appearance. The tough collagen is converted to tender gelatin when processed at the proper temperature.

Elastin, the stromal protein found in the circulatory system and connective tissue of the animal, provides elasticity. This protein does not break down when exposed to moist heat. Often referred to as the "yellow" connective tissue, elastin must be removed in the cutting of the meat. This protein also increases in the carcass as the age of the animal increases.

Fat : Fat contributes to the flavor of prepared meat. The fats in the animal's body vary from soft to solid. This variation is related to the species of the animal and to the placement of the fat in the body of the animal. The fat closer to the skin will normally be soft and more unsaturated. The fat in the more external parts of the body must act as an insulator. This is better accomplished by the softer fat. Those fats surrounding the vital organs in the body are harder and more saturated. Fat deposited within the muscles (marbling) is less saturated.

Although location of the fat in the carcass is important type of the fat, species plays an even greater role. The fat of the lamb is more saturated and more solid. The fat of the swine is generally softer and more unsaturated. The firmness of beef fat falls between lamb and pork. Both saturated and unsaturated fats yield nine calories per one gram of fat, while protein and carbohydrates yield four calories per one gram.

The fat content of the meat varies from 5 to 40% with the type, breed, and age of the animal.

Carbohydrates are found only in very small quantities in meat. The carbohydrates found in meat are glycogen and glucose.

Meat is an excellent source of some of the vitamins of the B complex. Liver is an excellent source of iron and vitamin A. the minerals elements occur either as separate ions or in a variety of compounds within muscles. Calcium and magnesium are essentials components of the contraction-relaxation cycle. Iron is a part of the red pigment and so influences color. Zinc is found in one of the enzymes. Meat is a good source of iron and phosphorous. Meat also contains sodium and potassium.

19.3 Factors that Affect the Quality of Meat

Fat: The fat present in meat indicates the quality, as it gives a good flavor. Fat in animals is found around the muscle fibers or between muscle fibers. It is interspersed between muscle fibers. The fat seen as small flecks of fat within the muscle is known as marbling and enhances the flavor of meat. Fat contributes moistness to the meat, makes it tender, enhances flavor and makes it succulent.

Color of the meat: Older animals have darker colored meat and a yellowish fat, whereas the younger animals have a lighter colored meat with a firm, dry, creamy white fat.

Tenderness: The tenderness of the meat depends upon the food the animal is fed on. The finer the grain, the more tender is the meat. The amount of connective tissue is directly related to the tenderness of meat. Cuts of meat with much connective tissue are tougher than those containing little connective tissue. The least used muscles such as are found in the loin and rib cuts, are more tender than those that are fully developed such as those found in neck, chuck, breast etc.

19.4 Factors that make Meat Tender

Moist heat: white connective tissue called collagen, changes into gelatin when moist heat is applied to it. Yellow connective tissue is called elastin, and this does not change by cooking or marinading. It should be either discarded or finely minced or chopped, which breaks it down.

Tenderizers: When use, tenderizers make the meat tender. Commercial tenderizers contain proteolytic enzyme, such as papain, an enzyme found in raw papaya and its leaf. Raw papaya paste applied to meat helps to tenderize it. Acidic foods like vinegar, tomatoes, curds, lemon, tamarind help to tenderize the food

Ripening or ageing of the meat: Meat should not be eaten immediately after killing as rigor mortis sets in and stiffens the muscles. The muscle is hung in cool conditions 1° - 2°C (34°-36°F), the time period varies depending upon the type of meat, i.e. beef, mutton, etc. There is an improvement in tenderness, flavor, moisture and color in the meat. Veal and pork are not hung.

Marinating: Tough meats soaked in an acidic solution, i.e. wine, vinegar, curds make the meat tender and enhance the flavor.

Mechanical pounding and grinding is done to meat to break down the connective tissue. Grinding breaks and cuts the muscle fibers and connective tissue making it possible for all ground meat to be prepared in a fashion similar to that used for tender cuts. Pounding is used to tenderize the meat; this process breaks and tears only the surface meat fibers and connective tissue.

19.5 Classes of Meat and Meat related Products

Lamb	Meat of the sheep or goat under one year old
Mutton	Meat of the sheep or goat over one year
Veal	Meat of the cattle slaughtered at three months of age
Beef	Meat of the cattle over one year old
Pork	Meat of the swine.
Organ meats	Liver, kidney, heart, brain and sweet breads.
sausages	Made of ground or minced meat and are enclosed in casings

19.6 Lamb/ Mutton

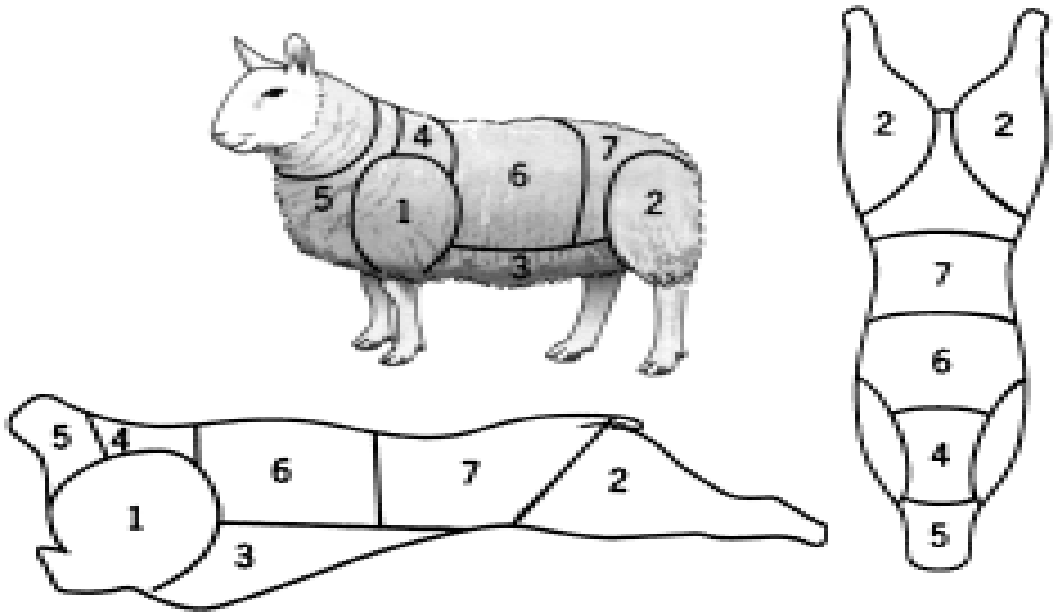
The preferred meat from the sheep is termed lamb. This must come from sheep under one year old. The animal over a year old is termed mutton. The lamb carcass yields smaller, more tender cuts of meat. Mutton is fatter, stronger tasting meat.

19.6.1 Sign of Quality:

- A good quality animal should be compact and evenly fleshed.
- The lean flesh should be firm, of a pleasing dull red color and of a fine texture or grain.
- There should be an even distribution of surface fat, which should be hard, brittle and flaky in structure, and of a clear white color.
- In a young animal the bone is pink and porous, so that when it is cut, a small amount of blood can be seen. With progressive aging bones become hard, dense, white and inclined to splinter when chopped.

19.6.2 Order of Dissection:

- Remove the shoulders
- Remove the breasts
- Remove the middle neck and scrag end
- Remove the legs
- Divide the saddle from the best end.



Joints of Lamb

19.6.3 Joints and their Uses

Joint No	Name of the Joint	French Name	Approximate Weight		Uses
			Lamb	Mutton	
01	Shoulder	L'epaule	2 kg	3.5 kg	Roasting, Stewing
02	Leg	Le Gigot	2.75 kg	3.75 kg	Roasting, Boiling
03	Breast	Le Poitrine	0.9 kg	1.75 kg	Roasting, Stewing
04	Middle neck	Le Collet	1.15 kg	1.7 kg	Stewing
05	Scrag end	Le CÔte découvete	0.45 kg	0.9 kg	Stewing, Broths
06	Best end	Le Carre	575 g	1.20 kg	Roasting, Grilling, Frying
07	Saddle	La Salle	1 kg	3.5 kg	Roasting, Grilling, Frying
08	Kidney	Le Rognon	1.5 kg	2.25 kg	Grilling, Sauté, Braising
09	Heart	Le Coeur	115 g	60 g	Braising
10	Liver	Le Foie		350 g	Frying
11	Sweet bread	Le Ris de Veau			Braising, Frying
12	Tongue	La Langue			Boiling, Braising

19.7 Beef

Beef and veal are got from the ' Bovine' animals and they are classified by their ages.

- Veal – flesh of calf (less than three months of age), which lives on milk.
- Calves – the animals are from 3-8 months of age
- Beef – the meat is taken when the animal is above 8 months.

Beef is the most popular of all the edible meats in the western countries. In India, beef is not very popular and buffalos are slaughtered in some places and sold under the name of beef.

Beef is the flesh of steers, heifers, cows, bulls and stags. The age and sex has an influence on the taste and quality of meat.

19.7.1 Signs of Good Quality:

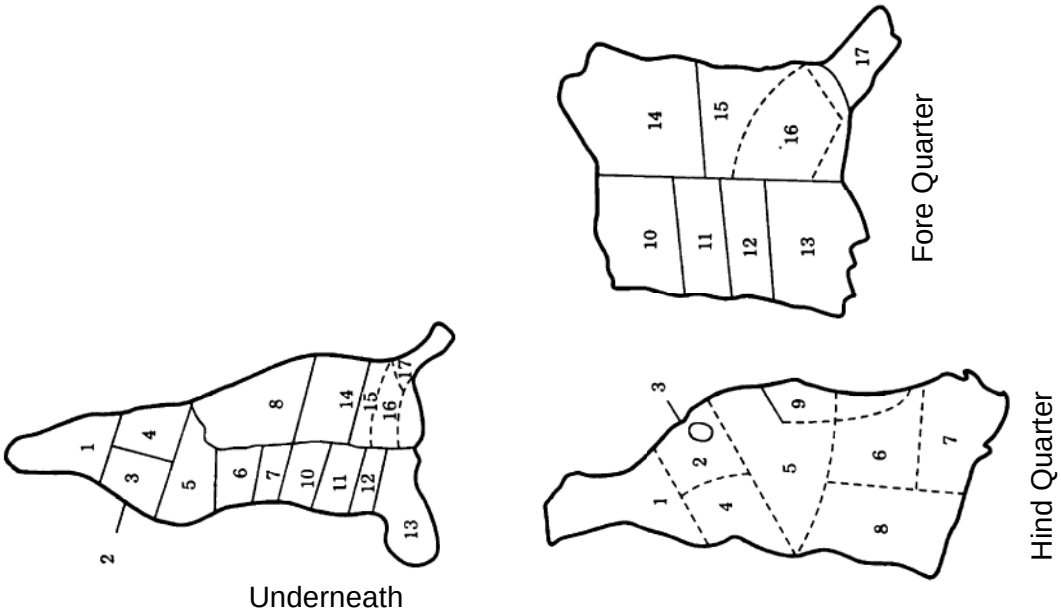
- The lean meat should be bright red with small flesh of white fat
- Fat should be firm, brittle in texture, creamy white in color and odorless. Older animals and dairy breeds have fat which is usually deeper yellow in color.

- Beef in good condition should have streaks of fat running through the lean section and the flesh should rise again after being pressed with the fingers. Any cut surface should present a slightly moist appearance to the touch

19.7.2 Order of Dissection: A whole side is divided into forequarter and hindquarter, the division being between the wing ribs and fore ribs.

Hind Quarter:

- Remove the rump, suet and kidney
- Remove the thin flank
- Divide the loin and rump from the leg. (The leg will consist of topside, silverside, thick flank, and shin)
- Remove the fillet
- Divide the rump from the sirloin
- Remove the wing ribs
- Remove the shin
- Bone out the aitchbone
- Divide the leg into topside, silverside, thick flank.



Fore Quarter:

- Remove the shank
- Divide in half down the centers
- Take off the fore ribs
- Divide into joints

19.7.3 Joints and their Uses

Joint No	Name of the Joint	French Name	Approx. Weight	Uses
01	Shin	Jambe de derrière	4 kg	Stewing, consommé
02	Topside	Coulotte de voeuf	7.5 kg	Stewing, Braising
03	Silverside	Gite a la noix, semelle	10 kg	Salt beef
04	Thick flank	Gite a la noix	6.7 kg	Stewing, Braising
05	Rump	Rump steak, Colutte de boeuf	7.2 kg	Grilling and Frying as steaks, Braising
06	Sirloin	Aloyau	10 kg	Roasting, Grilling, Frying
07	Wing ribs	Côte d'aloyau	5.9 kg	Roasting, Grilling and Frying steaks
08	Thin flank	Bavette	4 kg	Stewing, Boiling, Sausages
09	Fillet	Filet	2.72 kg	Roasting, Grilling, Frying
10	Fore rib	Côte Premiere	6.5 kg	Roasting, Braising
11	Middle rib	Côte découverte	8 kg	Roasting, Braising
12	Chuck rib	Côte du collier	4.08 kg	Stewing, Braising
13	Sticking piece	Cou (Collier)	10 kg	Stewing, Sausages
14	Brisket	Poitrine	6.8 kg	Salted and boiled
15	Plate	Plat de cot	5.9 kg	Stewing, Sausages
16	Leg of mutton	Gigot	10.5 kg	Stewing, Braising
17	Shank fat, bone of kidney	Jarret (trumeau)	4.05 kg 7.2 kg	Consommé, beef tea

19.7.4 Some Terms Associated with Beef

Carcass	Whole animal after dressing from the slaughter house
Side	A carcass that has been split down the center of the spinal column
Quarter	A side that has been subdivided into two sections as – forequarters – hindquarters.
Baron	A complete back (uncut) which is pair of sirloins undivided
Crop	Forequarters minus the plate, brisket and shin

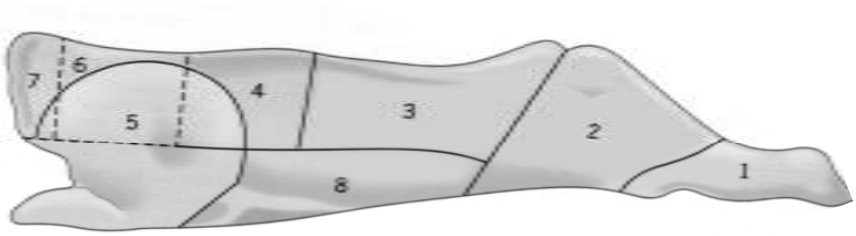
19.7.5 Steaks: Steak is a slice of beef varying in thickness usually taken from, fillet, rump or contre fillet. Steaks are tender and have a good flavor and are very popular. They are normally cut into individual portions that are thick enough to broil well and to develop a crisp well browned exterior, while retaining a juicy interior. Steaks are many types such as;

1. **Minute steak**: Sirloin cut into 1.25 cm (½") thick slices, flattened with a cutlet bat dipped in water making the steak as thin as possible. It is trimmed and then grilled or fried.
2. **Sirloin steaks**: Sirloin cut into 1.25 cm (½") thick slices, trimmed and then fried or grilled.
3. **Double sirloin steaks**: Sirloin cut into 2.5 cm (1") slices, trimmed and then fried or grilled.
4. **Porterhouse and T-bone steaks**: Complete slices of sirloin including the bone and fillet.
5. **Chateaubriand**: This is a double fillet steak taken from the head of a fillet of beef, 3.5 to 10 cm (1½"-4") thick, with an average weight of 340 grams to 1 kg. It is generally served grilled at a temperature of 204.5°C (400°F), done to the taste of the customer.
6. **Fillet steak**: These are approximately 115gm to 170gm in weight cut into 2.5 cm (1") thick slices and trimmed and then grilled or fried.
7. **Tournedos**: It is taken from the middle portion of the fillet. Remove all fat
8. **Fillet Mignon**: It is taken from the tail end of the fillet. All fat is removed and it is mixed or sliced as required.
9. **EntrecÔte steak**: A slice cut between two bones of a rib of beef, or cut from the contre fillet (bone sirloin or undercut), and weighing about 650 gm; sufficient for 4 persons.
10. **EntrecÔte minute**: Cut similar to entrecote steak from the sirloin or contrefilet as thinly as possible, about 1 cm in thickness, well flattened and served grilled or sautéed.
11. Steaks from other parts
    - **Point steak**: It is approximately 200 gms, in weight and is cut from the triangular part of the rump which is generally 2 cm thick.
    - **Tartare steak**: Finely chopped fillet of beef, finely chopped onion, parsley and capers. This is the only steak that is served raw.

19.8 Veal

Veal is the meat of diary calves, usually slaughtered at three months of age. It is a meat of great delicacy, light pink in color, soft in texture, and mild of flavor as a result of being fed only milk. Veal has always been a sought after meat.

The quality of the veal is judged, to a large extent, by its color. The lighter color of the meat, the greater the portion of the calf's diet was milk and more tender it will be. More mature veal is pink, with a creamy, white fat. Veal, having a little internal fat, has a tendency to be dry. For this reason it is often braised, larded or cut thinly and sautéed.



Veal Joints

Joint No	Name of the Joint	Approx. Weight	Uses
01	Knuckle	2 kg	Osso buco, Sauté, Stock
02	Leg	5 kg	Roasting, Braising, Sautéing
03	Loin	3.5 kg	Roasting, Frying, Grilling
04	Bets-end	3 kg	Roasting, Frying, Grilling
05	Shoulder	5 kg	Braising, Stewing
06	Neck-end	2.5 kg	Stewing, Sauté
07	Scrag	1.5 kg	Stewing, Stock
08	Breast	2.5 kg	Roasting, Stewing
09	Kidneys		Stewing, Sauté
10	Liver		Frying
11	Sweetbreads		Frying, Braising
12	Brains		Frying, Boiling
13	Head	4 kg	Boiling, Soup

19.9 Pork

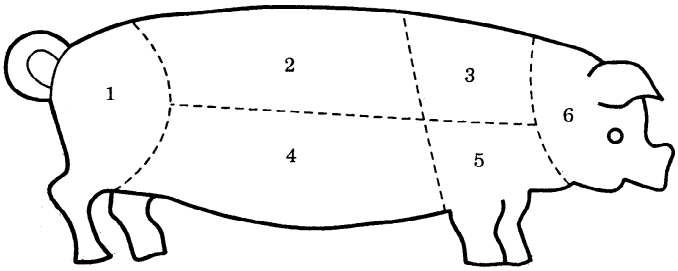
The flesh of pig is called as pork. Most of the pork meat comes from animals more than a year old and generally has more fat than other meats. A suckling pig is about 5 to 6 weeks old.

19.9.1 Signs of Quality:

- Lean flesh should be pale pink, firm and of a fine texture.
- The fat should be white, firm, smooth and not excessive.
- Bones should be small, fine and pinkish
- The skin or rind should be smooth.

19.9.2 Order of Dissection:

- Remove the head
- Remove the trotters
- Remove the legs
- Remove the shoulder
- Remove the spare ribs
- Divide the loin from the belly

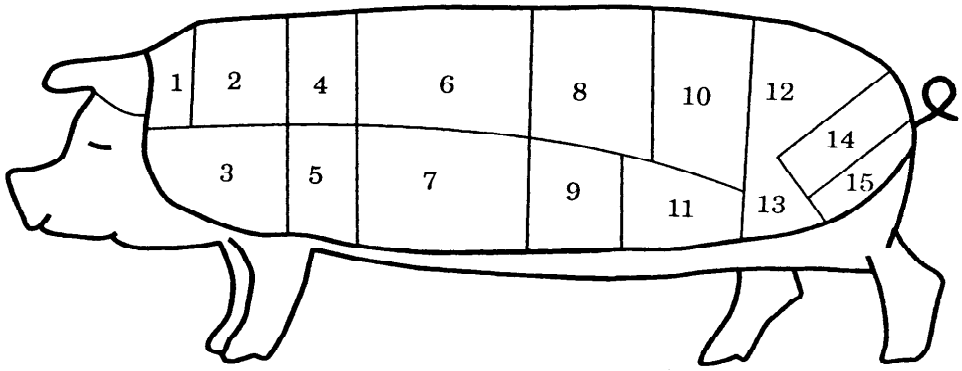


Pork Joints

19.9.3 Pork Joints and Their Uses

Joint No	Name of the Joint	French Name	Approx. Weight	Uses
01	Thigh	La Cuisse	4.55 kg	Roasting, Boiling
02	Loin	La Longe	5.45 kg	Roasting, Frying, Grilling
03	Spare rib	Le Côte découverte de porc	1.35 kg	Roasting pies
04	Belly (Breast)	La Poitrine	1.8 kg	Pickling, Boiling
05	Shoulder	L'épaule	2.7 kg	Roasting, Sausages, pies
06	Head (whole)	La Tête	3.6 kg	Brawn
07	Trotters	Le Pied		Grilling, Boiling
09	Liver	Le Foie		Paté

19.9.4 Pork Cuts and their Uses



Pork Cuts

Most cuts of pork are sold with the outer skin, or rind attached. Many butchers store the rind to prevent it both from deforming the cut as it shrinks during cooking, and to enable excess fat to escape.

Fresh pork is at its best from September to April (the months with an 'r' in them)

19.9.5 Bacon: Bacon is made by preserving the meat of carefully bred pigs. The preservative used is salt. This can be applied in two ways;

By covering the meat with dry salt and allowing at least 4 weeks for penetration

By sing a salt solution (Brine). The brine is injected into the flesh and the meat is immersed in a salt solution for 5 days.

Sometimes a combination of the two methods is used. Brine is injected into the meat and the sides are covered with dry salt for 2-3 weeks. It is then matured for about three weeks under controlled temperature. Desirable bacteria acting on the meat juices and salt produce the characteristics associated with well matured bacon.

This bacon is now ready for sale as 'green' or 'pale' bacon. In certain parts of the world bacon is preferred smoked. So it is then hung over smoldering wood dust for two days. This extracts excessive moisture and gives the bacon a distinctive flavor. Smoking also improves the preservation as it acts as an antiseptic. This is particularly suitable in hot climates

Good quality, well cured bacon should have a pleasant smell; the rind should be thin and smooth, the fat firm and free from any yellow marks; the lean part with a good deep pink color and mild and mellow in flavor.

19.9.6 Gammon is cut off the side of cured pork.

19.9.7 Ham: It is taken from the hind leg of the pig, preserved by curing or pickling in brine, then dried and smoked. Ham is prepared from fresh pork meat.

Boiling ham is done by placing it in the cold water first and soaking it. Then it is placed in a container covered with cold water and brought to boil slowly till it is cooked. Cooking time is 18-20 minutes

19.10 Offals

Offal is the name given to the edible parts taken from the inside of a carcass of meat: liver, kidneys, heart and sweetbreads. Brain, tongue, head and oxtail are also sometimes included under this term.

Fresh offal should be purchased and can be refrigerated under hygienic conditions at a temperature of -1°C (30°F), at a relative humidity of 90% for up to 7 days. Frozen offal must be kept in a deep freeze and defrosted in a refrigerator as required.

19.10.1 Liver:

- Calf's liver is considered the best in terms of tenderness and flavor. It is also the most expensive.
- Lamb's liver is mild in flavor, light in color and tender. Sheep's liver, being from an older animal, is firmer in substance, deeper in color and has a strong flavor.
- Ox or beef liver is cheapest and if taken from an older animal can be coarse in texture and strong in flavor. It is usually braised.
- Pig's liver has a strong full flavor and is mainly used for pates

Quality Points:

- Liver should look fresh, moist, smooth with a pleasant color and no unpleasant smell
- Liver should not be dry or contain an excessive number of tubes.

19.10.2 Kidneys:

- Lamb's kidneys are light in color, delicate in flavor and ideal for grilling and frying.
- Sheep's kidneys are darker in color and stronger in flavor
- Calf's kidneys are light in color, delicate in flavor and used in a variety of dishes.
- Ox kidney is dark in color, strong in flavor and is either braise, or used in pies and puddings
- Pig's kidneys are smooth, long and flat and have a strong flavor.

Cut No	Name of the Cut	Uses
01	End Collar	Boiling, Braising
02	Prime Collar	Boiling
03	Fore hock	Boiling
04	Top back	Boiling, Braising
05	Top streaky	Thinly sliced rashers can be used for frying and grilling
06	Back and ribs	Cut into rashers and grilled
07	Prime streaky	Boiled in one piece and cut into rashers
08	Short back	Frying
09	Thin streaky	Grilling, frying
10	Long back	Sliced thinly and fried gently or grilled quickly
11	Flank	Boiling, Frying
12	Corner gammon	Boiling, cut into rashers for grilling
13	Slipper	Boiled whole or cut into rashers
14	Middle gammon	Boiled whole (serve hot or cold) or lean rashers for frying
15	Gammon flock	Should be partly boiled and then baked (serve hot or cold)

Quality Points:

- Suet, which is the saturated fat in which kidneys are encased should be left on otherwise the kidneys will dry out. The suet should be removed when kidneys are being prepared for cooking.
- Both suet and kidneys should be moist and have no unpleasant smell.

19.10.3 Brains:

Calf's brains are those normally used. They must be fresh and have no unpleasant smell. They are a good source of protein with trace elements.

19.10.4Tongues:

Ox tongues and lamb and sheep tongues are those used in cooking. Ox tongues are usually salted then soaked before being cooked. Lamb tongues are cooked fresh.

Quality Points:

- Tongues must be fresh and have no unpleasant smell
- There should not be an excess of waste at the root end.

19.10.5 Head:

Sheep's head can be used for stock, pig's head for brawn (a cold meat preparation) and calf's head for sterility dishes (calf's head vinaigrette). Heads should be fresh, not sticky, well fleshed and free from any unpleasant smell.

19.10.6 Oxtail:

Oxtails usually weigh 1.5-2 kg; they should be lean with not too much fat. There should be no sign of stickiness and no unpleasant smell.

19.10.7 Hearts:

- Lamb's hearts are small and light and normally served whole
- Sheep's hearts are dark and solid and can be dry and tough unless carefully cooked
- Ox or beef's hearts are dark colored, solid and tend to be dry and tough.
- Calf's hearts, coming from a younger animal, are lighter in color and more tender.

Quality Points:

Hearts should not be too fatty and should not contain too many tubes. When cut they should be moist, not sticky and with no unpleasant smell.

19.10.8 Sweetbreads

These are pancreas and thymus glands known as heart breads and neck. The heart bread is round, plump and of better quality than the neck bread, which is long and uneven in shape. Calf's heart breads, considered the best, weigh up to 600 g; lamb's heart bread up to 100 g.

Quality Points:

- Heart and neck breads should be fleshy and of good size.
- They should be creamy white in color and have no unpleasant smell.

19.11 Sausages

A sausage is a mixture of ground meat, usually pork and seasonings stuffed into casing. The term sausage may also be used for the meat mixture itself, without the casing. Reduced to its simplest form, sausage meat may be, nothing more than ground pork seasoned with salt.

A sausage is generally composed of casings and forcemeat in the form of stuffing. The natural casings are intestines of sheep, hog and cattle, but they require a great deal of labor to be processed. Cellulosic or artificial intestines are made of edible or inedible cellulosic material. They are available in all sizes and are adapted to specific uses. Generally pork meat is used as a basic ingredient for forcemeat stuffing. Every forcemeat has a binding such as rice, potatoes or fat which hold meat.

Examples of sausages are frankfurters, chipolatas, salamis, mortadella and Strasbourg sausages

19.12 Cooking of Meat Products

Cooking can make meat more tender or less tender than original raw cut. When meat is cooked three types of changes contribute to increased tenderness. They are melting of fat, dissolution of collagen in hot liquids to become soft gelatin and tissue softening and muscle fiber separation. Over heating can cause muscle fibers to contact and met to shrink and become tougher; evaporation of moisture occurs and dried out tissues become tougher.

Selection of cooking methods for a meat cut depends upon whether it is tender or less tender cut. Less tender cuts become more tender when prepared by moist heat methods since this provides a means for the conversion of collagen to gelatin. Moist heat methods of cooking include braising, stewing and pressure cooking. Tender cuts do not require conversion of connective tissue. They are cooked by dry heat methods which include roasting, broiling, pan frying. Generally, lower cooking temperature for a monger period of time is better than higher temperature for short period of time for any degree of doneness. This results in decreased loss, less shrinkage, increased juiciness and more uniform color throughout the cut. Meat thermometer is used for testing doneness.

The following factors affect the cooking quality of meat:

- Types and treatment of live animal
- Slaughtering and carcass characteristics, the various muscles of the carcass
- The composition, structure and function of the muscles
- Post-mortem changes
- Cooking methods
- Processing treatments

Cooking destroys the micro-organisms that may have contaminated meat. Live trichinae are quickly destroyed by heating the meat to 55°C. Cooking brings about changes in the color of

the meat. When fresh meat is cooked its protein pigments are denatured. Denaturation of the protein causes rapid release of the haem pigments form the globin [part of the molecule and the free haem is very sensitive to oxidation. On heating red meat generally turns down due to the oxidized pigments in meat. This change in color is used as an index of cooked meat. Meat cooked to rare condition has less of oxymyoglobin denatured and more brown. Meats cured with nitrite retain red throughout cooking.

Nutritive value of cooked meat generally remains high. Normal cooking does not bring changes in the nutritive value of proteins and minerals are not lost by heat. Some minerals may be lost in meat drippings but on the other hand, cooking dissolves some calcium from bone and so enriches the meat in this material. There is loss of some vitamin B complex during cooking. But most of the cooked meat retains more than 50% of the B vitamin present in the uncooked meats.

19.13 Storage and Handling

The proper storage and handling of fresh meats requires close attention to detail. The basic guidelines are simple and brief. Yet when they are not adhered to, the rapid deterioration of the quality of the stored meat will result.

19.13.1 Guidelines for storage of Fresh Meats:

1. Check in purchases on arrival. This is to ensure that purchased meat is of good quality.
2. Wrap meat for storage.
3. Open vacuum-packaged meats only when they are to be used.
4. Store fresh meats at 32°-36°F (0°-2°C). Meat does not freeze until 28°F (-2°C)
5. Keep the meats separated from other foods in cooler and work on tables to prevent cross contamination.
6. Use fresh meats as soon as possible. They keep well for only two to four days. Ground meat, because of more surface area being exposed to bacteria and oxygen, has an even shorter life. Cured and smoked products may keep up to a week. However, for all meats, frequent deliveries are better than long storage.
7. Do not try rescue meats that are going bad by freezing them. Freezing will not improve the quality of spoiling meat.
8. Keep coolers clean at all times.

It is becoming more and more common for food service establishments to receive at least a portion of their meats frozen. Although this greatly improves the shelf life of the product, this is only true if the meat is properly handled before freezing; while frozen, and during thawing.

19.13.2 Guidelines for storage of Frozen Meats:

1. Meats being frozen should be well wrapped in moisture-vapor proof wrapping to prevent freezer burn.
2. Store frozen meats at -10°F or colder
3. Rotate stock, First In/ First Out. Frozen meats do not keep indefinitely. Recommended shelf life at 10°F is 9-12 months for beef; 6 months for veal and lamb; 4 months for pork, because pork fat turns rancid more readily in the freezer.

4. Thaw frozen meat carefully under refrigeration. Defrosting meats at room temperature encourages bacterial grow.
5. Do not freeze thawed meats, this increases loss of quality and may cause increased bacterial growth.
6. Keep freezers clean at all times.

19.14 Conclusion

The proper preparation of meat is a process which begins before the meat is received in the kitchen. Meat must be carefully selected and specified, always considering the intended end use of the product. Selection and specification are the steps in producing a quality final product while controlling food costs.

Knowledge of the composition of meat is a key to its proper utilization when it is received. Even the highest quality meat will become tough and tasteless when handled improperly. Cooking temperature, method and time must be suitable for the particular cut being prepared. When basic principle is adhered to, the resulting product will not be only be good tasting, but nutritionally sound as well.

Meat preparation is often perceived as only a matter of exposing the raw product to any type of heat until it no longer bleeds. Meat preparation goes beyond just the haphazard and random application of heat. The culinarian has the opportunity to exhibit the fruits of careful and knowledge production of meat in a wide variety of forms.

19.15 Self Assessment Questions

1. Draw the cuts of beef and pork. Name its parts and explain about their uses?
2. Discuss the order of dissection of lamb and the various lamb cuts and their uses with a neat diagram?
3. Describe in detail the physical and chemical composition of meat?
4. Discuss the factors involved in selection of beef, pork and lamb?
5. List and define four methods of tenderizing meat?
6. Write a brief note on sausages?

19.16 References

1. Modern Cookery – Volume I by Thangam E Phillip
2. Theory of Catering by Ronald Kinton & Victor Ceserani
3. Theory of Cookery by Krishna Arora
4. The Art and Science of Culinary Preparation by Jerald W Chesser
5. Food Science 3rd edition by B Srilakshmi

LESSON 20

Stocks

20.0 Objectives

- To introduce Stock/Fond as a culinary preparation and ingredient
- To discuss the elements and basic types of stocks
- To explain court bouillon in detail

Contents

20.1 Introduction

Stock is a supportive or structure, according to the dictionary. This is its primary definition. Stock is also defined as the original source from which something is derived. For the culinarians, it means “a liquid in which meat, fish or vegetables are simmered.” it is the basis for soup, sauce, gravy or stew. Although specified and stated differently, stock in the kitchen serves the same purposes as in the first two definitions.

According to Larousse, stock, also termed fond, is a “*liquid base for making a sauce, stew or braised dish.”*

Stock/Fond

The word fond comes from the word foundation. Just as a foundation is the base for a house, fond is the base for much cooking. Almost every culinary preparation requires a fond. For all practical purposes stock and fond have the same meaning.

Stocks are nutritious, aromatic, strongly-flavored liquids. They are important foundation liquids that are used in the preparation of various dishes such as soups, sauces, gravies, stews, curries, braising, rice and cold dishes.

The preparation of stocks call for understanding, care and discerning taste. Long, slow simmering of cold water used for stock (except for the fish stock) is required to draw out the flavor – and nutrients into the liquids. After cooking it is properly stored for a day when it ripens and gives a fuller flavor. To improve taste of Indian curries, pulaos, etc., it is important that stocks should be used.

20.2 Types of Stocks: There are three basic kinds of stock:

- White stock (fond Blanc)
- Brown stock (fond Brun)
- Vegetable or neutral stock (fond maigre)

20.2.1 White stock is made with white meat or beef, veal bones, chicken carcasses and aromatic vegetables. The bones are meat put in cold liquid and slowly brought to a boil. The mirepoix (flavoring base of diced vegetables and pork fat) is sweated in suitable fat and then added to the liquid before it develops any color. The mixture is reduced to a simmer to finish cooking. The stock is used for white sauce, blanquettes, fricassee and poached dishes.

Ingredients	1 Liter
Chicken bones	600 gms
Carrots	70 gms
Onions	35 gms
Bouquet Garni	
Leeks	25 gms
Celery	12 gms
Parsley stocks and roots	06 gms
Bay leaf	½ leaf
Thyme	½ sprig
Water	1½ liters

Method:

- Cut or break bones into 3" to 4" pieces and remove any marrow
- Wash and place into stock-pot and add cold water
- Bring to the boil and skim off the sum, add cold water and wipe the sides of the stock-pot clean with a clean damp cloth
- Add vegetables whole and the bouquet garni
- Allow the stock to simmer gently for 2 hours, during which time the fat that will rise to the surface must be constantly skimmed off.
- Pass though a muslin cloth, reboil and place it aside to cool.

20.2.2 Brown stock is made with beef, veal and poultry meat and bones. The bones are roasted till golden in color, not burnt. The mirepoix is added when the bones are three-quarters roasted. Tomato product may also added at this time. When the bones and mirepoix are golden in color, cold liquid is added and the mixture is slowly brought to a boil, then reduced to a simmer to finish cooking. This stock is used for brown sauces and gravies, braised dishes and meat glazes.

Ingredients	1 Liter
Beef / Veal / Mutton	600 gms
Ham bone	40 gms
Carrots	70 gms
Onions	35 gms
Bouquet Garni	
Celery	12 gms
Parsley stocks and roots	06 gms
Bay leaf	½ leaf
Thyme	½ sprig
Water	1½ liters
Beef fat	a little to brown the bones

Method:

- Cut or break bones into 3" to 4" pieces and place with fat in a roasting tray.
- Roast the bones or trimmings until rich brown in a hot oven. Remove bones form oven, place in a stock pot
- Cover with water, bring to boil and skim
- Add the fried carrot and onion, the bouquet garni and the ham bone
- The stock should simmer for 6 hrs.
- Skimming should be done at regular intervals
- Strain, reboil and use as required.

20.2.3 Vegetable stock is basically a neutral stock composed of vegetables and aromatic herbs sautéed gently in butter and then cooked in liquid.

Fish Stock (Fumet de Poisson) is categorized separately from the other basic stocks because of its limited usage.

20.3 Preparation of Stock

Stocks appear to be a simple item to prepare do not be misled. Although the ingredients are simple and the method simplistic, you must use great care. This is a base from which you will create a wide variety of other dishes, so the stock must be right.

The four principle steps in producing a quality stocks are:

1. Start with cold liquid.
2. Allow natural clarification to occur
3. Skim carefully
4. Simmer, do not boil.

20.3.1 Cold liquid to start

Beginning with a cold liquid prevents the sealing of the items. This makes it possible to release the flavors of the food, enhancing the liquid. This is a form of cooking by interchange. The flavors of the meat, bones, poultry, etc. are transferred to the liquid surrounding them.

20.3.2 Natural clarification

A high quality is a clear, clean appearance. This requires that it be clarified. Pouring the cooked stock through a fine sieve is not the kind of clarification that we mean here. It is the removal of the many minute particles which form in the cooking process.

Albumin is a protein complex found in muscles, blood, milk, egg white and many vegetables tissues, such as leeks. It is soluble only in cold water. Albumin is valued for its property of clarification by coagulation (forming a mass) when exposed to heat. The slower the application of heat, the better the removal of cloudiness from liquid.

Bringing stock slowly to a boil gives the albumin time to pass in to the solution. As its proteins coagulate, they attract particles in the liquid.

Do not wash your bones and meat prior to cooking stock. Fresh meat and bones do not need to be washed. Also, do not bring the stock to a boil. All the clarifying elements and light aromatics are then wasted. This reduces the flavor and increases your chances of producing a cloudy stock.

20.3.3 Skimming

As the stock cooks and the albumin coagulates, fat and scum will rise to the top of the pot. It is important to remove all of it. This removal is called skimming, carefully lifting fat and scum from the surface.

20.3.4 Simmering

This very simple operation is often misunderstood. Improper application of it generates most of the burned stocks and sauces. Simmering is when liquid is hot enough to form small bubbles that rise from the bottom of the pan.

The bubbles break just below the top surface of the liquid. As they rise and break a slight turbulence occurs.

When the temperature is too high, there is little or no movement in the liquid. Simmering. When correct, creates a slight roll in the liquid.

Simmering is very important in the cooking of stocks and sauces. When the slight roll of the simmer is not present, the coarser particles and sediments will settle on the bottom of the pan.

This creates an insulating layer between the heat and stock, which will burn. When it burns. It imparts an unwanted burnt flavor to the stock.

20.4 Remouillage

Remouillage means “second wetting.” After draining away the first stock, more water is added and the mixture is simmered again. This extracts additional flavor from the elements. This yields a weak stock, but it is richer than water. The Remouillage is often used as the liquid for making a new stock, thereby yielding a richer stock.

20.5 Preparations from stock

20.5.1 Essences

- Essences are stocks made in a reduced form. This creates a concentrated flavor. It is made in the same manner as stock, but with less liquid.
- Essence is used to boost the flavor of a stock, soup or sauce. The addition of this concentrated flavor is meant to enhance the already good flavor of the item. The best essences are made from highly flavored items, such as celery, truffles, mushrooms, morel, etc.

20.5.2 Glaze \ Glace

Glazes unite, in a reduced form, the principal strength and flavor of the ingredients in the stock. They have been reduced to consistency of syrup. This distinguishes them from the essences, which are only the extraction of the flavor of the product being used. The various glazes of meat, poultry, game and fish are widely used in modern cooking.

Glazes serve four basic purposes in cooking. In most cases, there are advantages to be gained from using a glaze instead of an essence.

1. Glazes give a brilliant shine and moist coating to a finished dish.
2. They reinforce the quality and tone of sauces.
3. Glazes strengthen the flavor and body of a preparation made from a weak stock.
4. Glazes can act as sauces when properly buttered or creamed to match the dish they are to be used.

20.5.3 Savory & Aspic Jellies

This chapter discusses aspic jelly only as it relates to stocks. Jellies are highly clarified and concentrated forms of stock. Through reduction it is possible for the cook to concentrate the natural gelatin content of the stock, creating a jelly. These are used to coat the cold foods, providing moisture, protection and flavor of the product.

These jellies gain their savor and quality from the flavor of the stock used. It is the quality of the stock, which ultimately determines the quality of the jelly.

Development of the high amount of gelatin needed for a jelly calls for some special ingredients. Calves feet and pork rind are both used. They are high in natural gelatin. The goal is to make a jelly which will set without the use of added gelatin. These also yield a jelly, which sets with a soft consistency.

When possible jellies should be made without added gelatin. However, this is not always possible. During the summer months, it is important that you test the consistency of the stock. This is done before clarifying by placing a little stock on ice. If the stock does not set well, add a few leaves of gelatin.

Artificial coloring is not recommended in aspic jelly. Normally, a quality stock will develop enough color naturally. If a deep amber color is desired for a savory, add some Madeira. This will also heighten the flavor.

20.6 Court Bouillon

Court bouillon is not actually a stock preparation. However it is used in a similar manner. It is flavorful poaching liquid used for fish and shellfish and some other items, such as sweetbreads.

A court bouillon is made up of three elements: aromatics and spices; salt and liquid. The mixture is not complete in nutritional elements. The flavor of the bouillon is created when fish are poached in it. It is then reduced and added to the sauce or possibly kept for future poaching.

Basic guide lines for using court bouillon are given below.

1. Court bouillon is always prepared in advance for all fish except turbot. The time for poaching is normally less than half an hour.
2. Whole fish should be immersed in cold court bouillon and then brought to poaching temperature.
3. Sliced fish should be placed in boiling court bouillon and reduced to a simmer.
4. When poaching in a small amount of liquid, the mirepoix is placed under the strainer in the pan with enough liquid to cover one-third of the piece of fish. Fish cooked in this manner should be frequently basted to prevent drying.
5. Court bouillon for lobster should always be at a full boil when the lobster is immersed. This is also true for small or medium fish au bleu.
6. Shellfish are always cooled in the court bouillon, again be careful of overcooking.
7. Fish, which is to be served cold, is cooled in the court bouillon. This improves flavor.

20.7 Conclusion

A simple stock is one the most important elements in the production of high quality dishes. It is really the foundation upon which your culinary creation stands. Be sure that it is a strong foundation, one which is clear, pure and flavorful.

20.8 Self Assessment Questions

1. Define the term ‘Stock’. List and discuss the four steps to produce a quality stock?
2. Discuss the preparation of court bouillon
3. List the basic types of stock / fond and discuss they are different from each other?

20.9 References

1. Professional Cooking 5th edition by Wayne Gisslen
2. The Art and Science of Culinary Preparation by Jerald W Chesser
3. Theory of cookery by Krishna Arora

LESSON : 21

Sauces

21.0 Objectives

- To introduce the cornerstone of culinary preparation
- To discuss the importance of sauces in food preparation
- To discuss thickening agents and the function of it in sauces
- To identify the mother sauces and discuss their preparation

Contents

21.1 Introduction

Sauce is a fluid dressing to dishes such as meat, poultry, fish and vegetables. Sauces used to moisten foods, to enhance the flavour, to increase the taste, to enrich the nutritive value of the food.

Sauces are liquids or semi-liquids mixtures. A keen sense of smell, delicate sense of taste, a light, strong hand for the blending – all contribute to the perfect sauce.

Long ago, Grimande de la Royere, philosopher and gastronomer wrote " The sauce is to culinary art, what grammar is to language".

A perfect sauce has a colorful appearance, is glowing in its rich smoothness, its texture is that of velvet, and it has a definite taste. It has a natural flavor and complements the food it accompaniments, rather than mask its taste.

It provides moisture, color and shine to food.

21.2 Importance of Sauces in Food Preparation

1. Enhances flavors
2. Some sauces help in digestion, e.g. mint sauce, applesauce with roast pork.

3. It gives moistness to the food, e.g. white sauce adds creaminess to firm and dry food.
4. Adds color to the food. Hollandaise sauce served on a vegetable adds color.
5. Served as an accompaniment
6. Enhances nutritional value of the dish

21.3 The components of Sauces: The major sauces we consider here are made of three kinds of ingredients.

- A liquid, the body of the sauce
- A thickening agent
- Seasoning and flavoring agents

21.3.1 Liquid: A liquid ingredient provides the body or base of most sauces. Most classic sauces are built on five liquids or bases.

- White stock (chicken, veal or fish) – for velouté sauces
- Brown stock (beef, veal) – for brown sauce
- Milk – for béchamel sauce
- Tomato plus stock – for tomato sauce
- Clarified butter – hollandaise sauce

21.3.2 Thickening Agents:

A sauce must be thick enough to cling lightly to the food. If it is not, it will simply run off the food and form a puddle on the plate. However, this does not mean that the sauce has to be heavy or pasty.

Although starches are the most commonly used thickening agents in the kitchen, in order to prepare high quality sauces you must be able to handle thickening agents of many types properly.

21.3.2.1 Roux: Roux represents the primary thickening compound of the mother sauces. Its preparation appears to be extremely simple, but in reality is crucial to the making of a god sauce.

21.3.2.2 Composition of a Roux

- A roux is a cooked mixture of equal quantities of clarified fat, usually butter.
- Fat in the roux acts as the bridge between the liquid of the sauce and the thickening agent, in this case the flour. To add the flour directly to the liquid would result in lumping. The far makes the thickening agent easily soluble in the liquid. Clarified butter is preferred for roux because:
    1. The power of absorption is greater in clarified butter.
    2. Bread flour or all-purpose flour is recommended because of their higher gluten content.

21.3.2.3 Types of Roux

There are three types of roux called White Roux, Blond Roux and Brown Roux. The rouxs each contain the same ingredients, but differ in coloration during cooking. Your choice of roux for your sauce will affect the flavor of the finished sauce.

- **White roux** is cooked just for few minutes, just enough to cook out the raw taste. Cooking is stopped as soon as the roux has a frothy, chalky, slightly gritty appearance, before it has begun to color. This is used for all cream sauces.
- **Blond roux** is cooked a little longer, just until the roux begins to change to a slightly darker color. It used for all velouté sauces.
- **Brown roux** is cooked until it takes on a light-brown color and a nutty aroma. It is used for all brown sauces.

  The white and blond rouxs require less cooking time and can be made as needed. Brown roux requires a longer cooking time and is normally cooked in advance, in large batches.

21.3.2.4 Cooking the Roux

1. Melt fat
2. Add correct amount of flour and stir until fat and flour are thoroughly mixed
3. Cook to require degree for white, bond and brown roux.

Cooking roux is done in a saucepan on top of the stove, and the roux is stirred for even cooking. Use low heat for brown roux, moderate heat for white or blond roux. Large quantities may be baked in an oven. Some restaurants make up batches large enough to last for several days or a week.

The time allowed for cooking a roux cannot be precisely stated. It depends on the degree of heat. The more intense the heat, the quicker the roux will cook. However, as a rule, the longer and slower the roux is cooked, the butter.

Every roux should be cooked slowly for a relatively long period of time, until the taste, humidity and acidity of the raw flour has disappeared.

Other Thickening Agents

Cornstarch – An excellent, all purpose starch. It is easy to work with and is inexpensive; however, it has poor holding quality; gives sauces an opalescent tinge, and a slight taste of corn.

Arrowroot – This is the best starch for shine and transparency in a sauce, but is difficult to work with. It gives too much elasticity to the sauce. It is best to use in the kitchen.

Tapioca starch – This is very similar in use to arrowroot, but much cheaper. It is easier to work with and does not give excessive elasticity to the sauce.

Beurre Manie is a mixture of equal parts soft, raw butter and flour worked together to form a smooth paste. It is used for quick thickening at the end of cooking, to finish a sauce. The raw butter adds flavor and gives a sheen to the sauce when it melts.

Final Liaison: Liaison is the French term for any mixture used for thickening or binding sauces, soups and other culinary preparations. However, in today's commercial kitchen the term

is usually used to refer specially to a mixture of egg and cream used to finish sauces and soups. Egg yolks have the power to thicken sauce slightly due to coagulation of egg proteins when heated.

Blood: The blood of poultry or game or the coral and tomalley of lobster is used to thicken the sauces. It is generally used for fame dishes, for example Jugged Hare.

21.3.3 Flavoring Agents: Although the liquid that makes up the bulk of the sauce provides the basic flavor, other ingredients are added to make variations on the basic themes and to give a finished character to the sauces.

The seasoning and flavoring agents used in sauces are virtually unlimited. The cardinal rule of flavoring and seasoning, no matter what the sauce, is that it should be well balanced. A well balanced sauce aims for a subtle equilibrium of many ingredients, with no single flavor dominating.

The food, it is to accompany must be taken into consideration to ensure that the sauce complements, not over-whelms, the dish. The very origins of the word sauce, from the Latin *Salso* meaning 'Salty', emphasizes its role in high-lighting the flavor of a dish.

A sauce should always taste too strong by itself. Its flavor should be too concentrated to be palatable in quantity. If a sauce is to be reduced, it should be lightly seasoned only, since it will become too concentrated as the liquid reduces.

21.4 Classification of Sauces: The sauces could be grouped as follows

- Basic sauces / Mother sauces
- A class of their own (miscellaneous)
- Butter sauces

21.4.1 Mother Sauces: The family of sauces called mother sauces derives its name form its primary place in the hierarchy of culinary art. The six mother sauces form a foundation for many culinary preparations.

Basic sauces have a great value because of their use and resiliency. When prepared properly, they have a relatively long shelf life in the refrigeration. Preparation of mother sauce is a time consuming task. Therefore, mother sauces are normally prepared in bulk and refrigerated. The saucier uses them as a base for the compound sauces needed each day.

Basic sauces are Béchamel, Velouté, Espagnole, Tomato, Hollandaise and Mayonnaise.

21.4.1.1 Béchamel: The base of this sauce is milk. It may be flavored in a variety of ways and is an ingredient in many dishes. It is used for various types of vegetables and cream dishes including soups, poultry, dairy, and pasta. It is prepared with white roux and mildly flavored with onions.

Method:

- Bring milk to boil with studded onion and set aside.
- Melt butter in a thick-bottomed pan
- Add flour, stir and cook the roux over a gentle fire without coloring till it gets a sandy texture. Pour the milk into the roux stirring with a studded spoon to avoid lumps. Simmer

gently for half-an-hour. Remove the studded onion and pass through a fine strainer, cover with butter to prevent the formation of a skin.

Derivatives of Béchamel

Ingredients	1 Liter
Flour Butter Milk Onion studded with clove and bay leaf	90g 90g 1 litre 1

21.4.1.2 Velouté: It is a basic blond sauce. It is prepared from blond roux and stock. These are the finer grade of the white sauces. This is base on the fact that they are made from strong flavorful liquids, such as chicken broth or fish broth. There are two types of Veloutés namely chicken Velouté, and fish Velouté. Velouté gets its name form the type of stock used in the making.

Method:

- In a thick bottomed pan prepare blond roux
- Add cold stock into the roux, stir vigorously to avoid lumps.
- Add mushroom trimmings
- Simmer gently for one hour, stirring frequently with a wooden spoon
- Pass through a fine strainer and cover with butter, to prevent the formation of skin.

Derivatives of Chicken Velouté

1.	Scotch egg sauce	01 litre béchamel, 03 half boiled eggs finely chopped 200 ml fresh cream
2.	Lobster sauce	01 litre béchamel, 50 gm anchovy paste, 250 gm lobster butter, cayenne pepper, Seasoning. Finished with cream
3.	Curry sauce	01 litre béchamel, 50 gm curry powder, strain, add liaison of 02-egg yolks and 100 ml cream.
4.	Cardinal sauce	01 litre béchamel, little fish stock, liaison of 02 egg yolks and 200 ml cream.
5.	Mornay sauce	01 litre béchamel sauce, 100 gm grated cheese, 100 gm butter, finish with liaison of 03-egg yolks and 300 ml cream.

Derivatives of Fish Velouté

1.	Nantua sauce	Fish Velouté+ reduction of white wine and shrimps, tomato concentrate (puree) and butter.
2.	Diplomat sauce	Fish Veloute+ lobster tails, liaison of egg yolk and cream and lemon juice.
3.	Normande sauce	Fish Velouté + butter, mushroom, oyster juice finished with liaison of egg yolk and cream.
4.	Oriental sauce	Normande sauce with curry powder.
5.	Anchovy sauce	Fish Velouté + anchovy paste finished with liaison of egg yolk and cream.

21.4.1.3 Brown Sauce / Espagnole: Brown sauce is made from brown stock and brown roux. It is one of the most widely used basic sauces.

Espagnole, the original brown sauce, has been the glory of the French kitchen. The name dates from the 18th century, when the finest ham, an essential ingredient of Espagnole, was said to come form Spain. Two or three days were required to mark the sauce. First the roux was slowly browned to develop the flavor. Then a rich brown stock was added together with pieces of veal, ham, a stewing fowl or a game bird.

Ingredients	1 Liter
Flour	70 g
Butter	75 g
Tomato puree	30 g
Brown stock	1¼ Liter
Mirepoix	
Carrots	70 g
Onions	70 g
Bacon trimmings	30 g
Chopped parsley	20 g
Celery	20 g
Bay leaf	½ leaf

Method:

- Prepare brown roux in a heavy – bottomed pan and cool.
- Add tomato puree, stirring to, prevent lumps
- Gradually mix in hot stock, stirring vigorously to blend well and cook on a gentle fire.
- Sauté the mirepoix in fat and add the sautéed vegetables to the sauce
- Simmer gently for 4-6 hours
- Remove the scum when it comes to the top
- Strain and cover with a thin layer of butter

Derivatives of Espagnole

1	Robert sauce.	Demi-glace+ white wine reduced with chopped onion (sautéed), vinegar, pepper+ mustard.
2.	Sauce Piquante	Demi-glace+ white wine reduced with chopped shallots and vinegar, strained. Garnished with juliennes of gherkins, chervil and tarragon.
3.	Sauce Charcutiere	Robert sauce, garnished with juliennes of gherkins
4.	Sauce Bordelaise.	Demi-glace+ chopped shallots, crushed pepper, thyme, bay leaf, reduced with red wine, strained.
5.	Chasseur sauce	Demi-glace+ chopped shallots reduced with white wine, and sautéed minced mushroom, butter, chopped parsley.

Note: Demi-glace is a combination of equal quantities of Brown stock and brown sauce.

21.4.1.4 Tomato Sauce: It is red kitchen sauce having some piquancy. It is served with Ravioli or spaghetti, eggs, fish and meat. It adds color to the dish.

Ingredients	1 Liter
Flour	80 g
Butter	70 g
Bacon trimmings	40 g
Onions	80 g
Carrots	80 g
Celery	40 g
Bay leaf	½ leaf
Garlic crushed	1 clove
Tomato puree	100 g
Tomatoes chopped	50g
Brown stock	450 ml
Sugar	10 g
Salt	3 g

Method:

- Melt butter in a pan
- Add roughly chopped vegetables, crushed garlic an sauté till slightly brown
- Mix in flour and fry till it gets a sandy texture and gets a slightly brown color
- Add tomato puree and chopped tomatoes
- Add cold stock, stirring to prevent lumps and bring to boil.
- Add seasoning and cook for 1½ hours.
- Skim frequently.
- Strain and cover with butter.

Derivatives of Tomato sauce

1.	Portugaise	Tomato sauce + white wine+ tomato concasse + garlic
2.	Italienne	Tomato sauce + demi-glaze+ chopped shallots+ mushrooms + lean ham + fine herbs
3.	Barbecue	Tomato sauce + ketchup + vinegar + sugar
4.	Provencale	Tomato sauce + sautéed mushrooms + chopped parsley + garlic + tomato concasse + sugar
5.	Bretonne	Tomato sauce + sautéed chopped onions + white wine + butter + chopped parsley

21.4.1.5 Hollandaise Sauce (Hot butter sauce): It is a warm yellow and rich sauce. It contains a high percentage of fat and egg yolks. It is an emulsion of butter, lemon juice and egg yolks. Hollandaise is served over grilled or baked fish, vegetables and egg. It is an accompaniment to cauliflower, asparagus, broccoli, salmon and trout fish.

Ingredients	½ Liter
Vinegar	30 ml
Pepper	8 no
Water	100 ml
Egg yolk	5 no
Butter	500 gms
Lemon	2 no

Method:

- Place crushed peppercorns with vinegar in a pan, reduce completely.
- Add cold water and boil for some time and cool.
- Mix with egg yolk with a whisk on the double boiler till it is thick.
- Mix the clarified butter until thoroughly combined. Add lemon juice to taste.
- Strain through a fine strainer, correct seasoning

Derivatives of Hollandaise sauce

1.	Béarnaise Sauce	Hollandaise+ chopped tarragon and chives.
2.	Choron Sauce	Béarnaise+ tomato puree.
3.	Mousseline.	Equal quantities of hollandaise and whipped cream.
4.	Maltaise sauce	Hollandaise+ orange juice and orange zest.
5.	Polaise sauce	Hollandaise+ chopped mint.

21.4.1.6 Mayonnaise Sauce: Mayonnaise is a basic cold sauce. It is used as a salad dressing and as an accompaniment. It has a wide variety of uses, particularly in Hors d'oeuvres and salads. It is a rich sauce, as it is thickened with egg yolk and has a high percentage of fat. Sometimes it is thickened with gelatin and is used as a shiny flavorful coating, to decorate cold dishes or buffets.

Ingredients	1 Liter
Salad oil or Olive oil	1 liter
Egg yolks	8 no
French mustard	¼ tsp
Vinegar	25 ml
Lemon	1 no
Seasoning	to taste

Method:

- Place yolks of eggs, vinegar, and seasoning in a clean bowl and whisk well.
- Add oil slowly, a little at a time, whisking continuously, until all the oil is incorporated.
- Finish the sauce by adding the lemon juice and warm water.

Special points to be noted:

- Do not expos mayonnaise to too low temperature after making it
- Initially, the oil should not be added rapidly.
- The oil should be in proportion to egg yolks.
- Use hot water when necessary as it acts as a stabilizer.
- Cover the sauce with a lid, and store in a cool place.

Rectification of a Curdled Mayonnaise:

- Take a clean bowl, add boiling water or vinegar and gradually whisk in the curdled sauce.
- Place an egg yolk and gradually whisk in the curdled sauce.
- If a small quantity of mayonnaise to be rectified then put mustard powder in a clean bowl and add in drop by drop, whisking the curdled mayonnaise.

Derivatives of Mayonnaise

1.	Tartare sauce.	Mayonnaise+ gherkins+ cocktail onions, capers, chopped parsley, hard-boiled egg white and cream.
2.	Cocktail sauce.	Tomato ketchup+ capsico+ brandy+ mayonnaise.
3.	Remoulade sauce.	Tartare sauce+ anchovy essence.
4.	Sauce Gribiche.	Mayonnaise started with hot boiled egg yolk, proceed as per tartare sauce.
5.	Tyrolienne sauce.	Mayonnaise+ tomato and sautéed onion (strained)+ chopped parsley, chervil and tarragon.

21.4.2 Sauces, a class of their Own:

These sauces have an individuality of their own in color and flavor. They blend with food items they accompany or give a contrasting sharpness. The sauces are bread, apple, mint, cranberry and horse-radish sauces.

1.	Apple	Apple puree + cinnamon powder + butter + sugar + water
2.	Bread	Flavored milk with onions + breadcrumbs + butter + cream + seasoning
3.	Cranberry	Cranberries + sugar + water
4.	Mint	Vinegar + sugar + seasoning + chopped mint
5.	Oxford	Red currant jelly + chopped shallots+ port wine + orange juice + chopped, blanched oranges + lemon zest.

21.4.3 Butter Sauces: They are served melted, in a liquid form or as hard butter sauces. Butter is mixed with different ingredients, set and cut in fancy shapes and served with food items. They are placed on the hot food items, just before serving and allowed to melt. It can be served separately, along with the dish in a sauce-boat and crushed ice. The other name for butter sauces is compound butter sauces. E.g. Anchovy, Colbert, Brown butter etc.

1.	Garlic butter	Soften butter + garlic paste + lemon juice
2.	Colbert	Parsley butter + dissolved pale meat glaze + chopped tarragon
3.	Anchovy	Butter + seasoning+ anchovy essence
4.	Shrimp	Butter + finely chopped shrimp
5.	Maitre d'hotel beurre	Butter + lemon juice + chopped parsley + seasoning

21.5 Conclusion

The function of the sauce is to add compatible flavor to an item. This basic rule allows for a great deal of latitude in the development of sauces. Put to work the basic information provided here and begin to create your own sauces, always remembering that the sauce' s purpose is to enhance, not mask, the flavor of the item.

Sauces play aver important role in Western cuisine. Various dishes are named after the sauce that is used. Sometimes very slight variations change the name of the sauce and some derivative sauces are even used to make other sauces.

21.6 Self Assessment Questions

1. Define roux? Discuss various types and their uses?
2. Describe the function of a sauce?
3. List the mother sauces and give the method of preparation for at least two?
4. Write a short note on compound butter sauces?
5. Give one method of rectifying mayonnaise?
6. Name the mother sauces and give at least two derivatives of each. Give the recipes of hollandaise and velouté sauce?

21.7 References

1. Professional Cooking 5th edition by Wayne Gisslen
2. The Art and Science of Culinary Preparation by Jerald W Chesser
3. Theory of cookery by Krishna Arora

LESSON 22

Soups

22.0 Objectives

- To define the term soup
- To introduce the classification of soups
- To discuss the preparation procedure of clear and thick soups
- To explain the garnishment of soups

Contents

22.1 Introduction

Soup is a liquid food consisting of meat, seafood, vegetables, cereals or poultry. They play an important role on the menu and are regarded as appetizers as they stimulate the appetite for the higher foods to follow. On the menu they are served as the first course, if hors d'oeuvres are not being served.

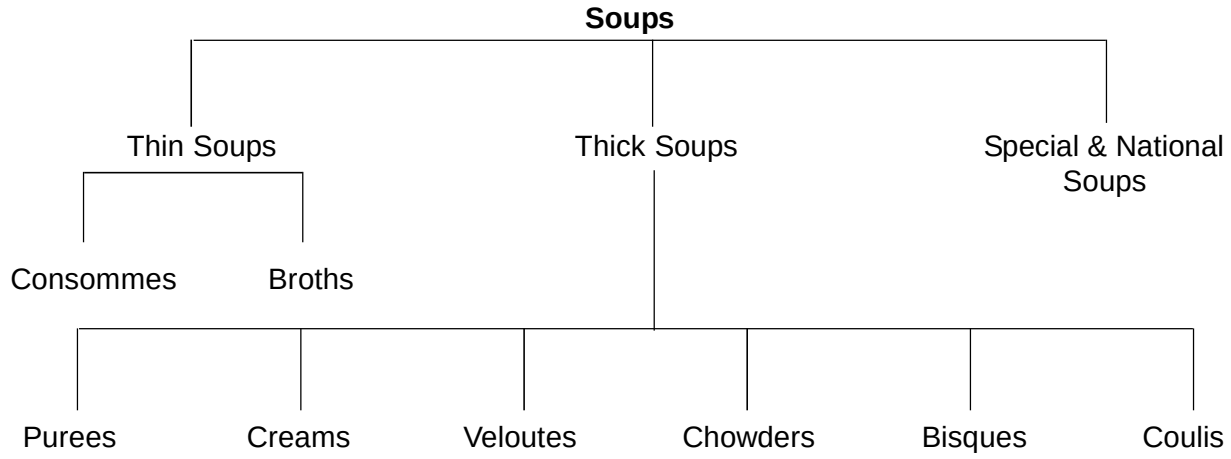
Soups have held an important place in the cuisine of every culture since the dawn of humanity. Archaeology shows that primitive people made fireproof vessels. In these they cooked meats, grains and vegetables in liquid.

It took almost a century to bring soups to the perfection of today. Modern cooking has replaced the sturdy dishes of the past with simple, savoury preparations.

George Auguste Escoffier, the master of world cuisine in the late 19th and early 20th centuries, believed that soup, and the stocks they were based upon, were of utmost importance in modern cuisine. In his famous **"Le Guide Culinary",** Escoffier states that,

"Stock is every thing in cooking. Without it, nothing can be done. If ones stock is good, what remains of the work is easy…"

22.2 Classification of Soups



Most soups can be classified by cooking techniques and appearance as either clear or thick.

- **Clear soups** include broths made from meat, poultry, game, fish or vegetables as well as consommés, which are broths clarified to remove the impurities.
- **Thick soups** include cream soups and puree soups. The most common cream soups are those made from vegetables cooked in a liquid that is thickened with starch and pureed; cream is then incorporated to add richness and flavour. Puree soups are generally made from starchy vegetables or legumes. After the main ingredient is simmered in a liquid, the mixture- or a portion of it- is pureed.
- **Some soups** (notably Mulligtwany and minestroni as well as cold soups such as Gazpacho and fruit soups) are neither clear nor thick soups. Rather, they use special preparation methods or a combination of the methods mentioned above.

A soup's quality is determined by its flavour, appearance and texture. A good soup should be full flavoured, with no off or sour tastes. Flavours from each of the soup's ingredients should be crystal clear. The vegetables in vegetable soup should be brightly coloured, not gray. Garnishes should be attractive and uniform in size and shape. The soup's texture should be very precise. If it is supposed to be smooth then it should be very smooth and lump-free. If the soft and crisp textures of certain ingredients are supposed to contrast, the soup should not be overcooked, as this causes all the ingredients t become mushy and soft.

22.3 Clear Soups

22.3.1 Broths: The techniques for making stocks are identical to those used for making broths. Like stocks, broths are prepared by simmering, flavouring ingredients in a liquid for long periods of time. Broths and stocks differ, however, in two ways. First, broths are made with meat instead of just bones. Second, broths (often with a garnish) can be served as finished dishes, while stocks are generally used t prepare other items.

Broths are made from meat, poultry, fish or vegetables cooked in a liquid. An especially full-flavoured broth results when a stock and not just water is used as the liquid. Cuts of meat from the shank, neck or shoulder result in more flavourful broths, as will the flesh of mature poultry. Proper temperature, skimming and straining help produce well flavoured, clear broths.

Procedure for Preparing Broths:

- Truss or cut the main ingredient.
- Brown the meat; brown or sweat the mirepoix or vegetables in an appropriate stockpot.
- Place the main ingredient and mirepoix or vegetables in an appropriate stockpot and add enough cold water or stock to cover. Add a bouquet garni or sachet d'epices if desired.
- Bring the liquid slowly to a boil; reduce to a simmer and cook; skimming occasionally, until the main ingredient is tender and the flavour is fully developed.
- Carefully strain the broth through a china cap lined with cheesecloth; try to disturb the flavouring ingredients as little as possible in order to preserve the broth's clarity.
- Cool and store following the procedures for cooking stocks or bring to a boil, garnish as desired and hold for service.

Common additions for broths include sherry or Madeira, lemon, hot pepper sauce, red wine for beef and white wine for veal.

Broths can be accompanied by baked, toasted or fried Croûtes, grated Parmesan or Swiss cheese.

22.3.2 Consommés:

Consommé is a concentrated, thin, clear soup made from meat, poultry or fish. The word has the same origin as consummate, meaning to bring to completion or perfection. A consommé is cooked long enough for most of the nutritive properties of the ingredients to be extracted in to the liquid.

Consommé is the most sophisticated of all stock based soups. It is made by reducing veal, beef, and chicken. The liquid is then clarified, enriching it with nutritive and aromatic substances, producing a transparent, sparkling liquid. This soup may be garnished in many different ways depending on the base from which it is made.

Well- prepared consommés should be rich in flavour of the main ingredient. Beef and game consommé should be dark in colour; consommés made from poultry should have a golden to light amber colour. They should have substantial body as a result of their high gelatin content, and all consommés should be perfectly clear with no trace of fat.

Because a consommé is a refined broth, it is absolutely essential that the broth or stock used be of the highest quality. Although the clarification process adds some flavour to the consommé, the finished consommé will be only as good as the stock or broth from which it was made.

The Clarification Process:

The term consommé double describes the process where by the meat or fish flavor is extracted twice; first when making stock, second when clarifying the consommé. It is the clarification, which makes it a true consommé.

To make a consommé, you clarify a stock or broth. The stock or broth to be clarified must be cold and grease free. To clarify, the cold degreased stock or broth is combined with a mixture known as clear meat for clarification. A clear meat is a mixture of egg whites ground meat, poultry or fish; mirepoix, herbs and spices; and an acidic product, usually tomatoes, lemon juice or wine. (An onion brulee is also often added to help flavour and colour the consommé.)

The stock or broth and clear meat are then slowly brought to a simmer. As the albumin in the egg whites and meat begins to coagulate, it traps impurities suspended in the liquid. As coagulation continues, the albumin-containing items combine with the other clear meat ingredients and rise to the liquid's surface, forming a raft. As the mixture simmers, the raft ingredients release their flavors, further enriching the consommé.

After simmering, the consommé is carefully strained through several layers of cheesecloth to remove any trace of impurities. It is then completely degreased, either by cooling and refrigerating, then removing the solidified fat or by carefully ladling the fat from the surface. The result is a rich, flavourful, crystal-clear consommé.

Procedure for Making Consommés:

- In a suitable stockpot (one with a spigot makes it much easier to strain the consommé when it is finished), combine the ground meat, lightly beaten egg white and other clearmeat ingredients.
- Add the cold stock or broth and stir to combine with the clearmeat ingredients
- Over medium heat, slowly bring the mixture to a simmer, stirring occasionally.
- As the raft forms, make a hole in its center so that the liquid can bubble through, cooking the raft completely and extracting as much as possible from the raft ingredients.
- Simmer the consommé until full flavour develops, approximately 1 to 1 ½ hours.
- Carefully strain the consommé through several layers of cheesecloth and degrease completely.
- If the consommé will not be used immediately, it should be cooled and refrigerated, following the procedures for cooling stocks. When the consommé is completely cold, remove any remaining fat that solidified on its surface.
- If, after reheating the consommé, small dots of fat appear on the surface, they can be removed by blotting with a small piece of paper towel.

Correcting a Poorly Clarified Consommé: A clarification may fail for a variety of reasons. For example, if the consommé is allowed to boil or if it is stirred after the raft has formed, a cloudy consommé can result. If the consommé is insufficiently clear, a second clarification can be performed using the following procedure. This second clarification should be performed only once, however, and only if absolutely necessary, because the eggs not only remove impurities but also some of the consommé's flavour and richness.

- Thoroughly chill and degrease the consommé.
- Lightly beat four egg whites per gallon (4 lit) of consommé and combine with the cold consommé.

- Slowly bring the consommé to a simmer, stirring occasionally. Stop stirring when the egg whites begin to coagulate.
- When the egg whites are completely coagulated, carefully strain the consommé.

Garnishes and Accompaniments for Consommé:

- Consommé garnish is added just before serving, so that it does not cloud the soup. No ingredients should be larger then the size of pea, and all cut garnishes must fit within the well of a bouillon spoon.
- Good accompaniments for consommé are cheese straws, wafers, small puffs or pate a choux.

22.4 Thick Soups

22.4.1 Cream Soups: Most cream soups are made by simmering the main flavouring ingredient (for example, broccoli for cream of broccoli soup) in a white stock or thin veloute sauce to which seasonings have been added. The mixture is then pureed and strained. After the consistency has been adjusted, the soup is finished by adding cream. In classic cuisine, thin béchamel sauce is often used as the base for cream soups and can be substituted for veloute I many cream soup recipes, if desired.

Both hard vegetables (e.g., celery and squash) and soft or leafy vegetables (e.g., spinach, corn, broccoli and asparagus) are used for cream soups. Hard vegetables are generally sweated in butter without browning before the liquid is brought to a boil. Because cream coups are pureed, it is important to cook the flavouring ingredients until they are soft and can be passed through a food mill easily.

All cream soups are finished with milk or cream. Using milk thins the soup while adding richness; using the same amount of cream adds much more richness without the same thinning effect. Cold milk and cream curdle easily if added directly to a hot or acidic soup. But there are several steps that can be taken to prevent curdling.

- Never add cold milk or cream to hot soup. Bring the milk or cream to a simmer before adding it to the soup. Or, temper the milk or cream by gradually adding some hot soup to it and then incorporating the warmed mixture into the rest of the soup.
- If possible, add the milk or cream to the soup just before service.
- Do not boil the soup after the milk or cream has been added.
- The presence of roux or other starch helps prevent curdling. Therefore, Béchamel or cream sauce is often used instead of milk or cream to finish cream soups.

Procedure for Making Cream Soups:

- In a soup pot, sweat hard vegetables such as squash, onions, carrots and celery in oil or butter without browning.
- In order to thicken the soup:
    a) Add flour and cook to make a blonde roux, then add the cooking liquid (i.e., the stock), or

b) Add the stock to the vegetables, bring the stock to a simmer and add a blonde roux that was prepared separately, or

c) Add a thin veloute or béchamel sauce to the vegetables.

- Bring to a boil and reduce to a simmer.
- Add any soft vegetables such as broccoli or asparagus, and a sachet or bouquet garni as desired.
- Simmer the soup, skimming occasionally, until the vegetables are very tender.
- Puree the soup by passing it through a food mill, blender, food processor or vertical chopper mixer (VCM) and strain through a china cap. If the soup is too thick, adjust the consistency by adding boiling white stock.
- Finish the soup by adding hot milk or cream or a thin béchamel or cream sauce. Adjust the seasonings and serve.

22.4.2 Puree Soups: Puree soups are hearty soups made by cooking starchy vegetables or legumes in a stock or broth, then pureeing all or a portion of them to thicken the soup. Puree soups are similar to cream soups in that they both consist of a main ingredient that is first cooked in a liquid, then puree. The primary difference is that unlike cream soups, which are thickened with starch, puree soups generally do not use additional starch for thickening. Rather, puree soups depend on the starch content of the main ingredient for thickening. Also, puree soups are generally coarser than cream soups and are typically not strained after pureeing. When finishing puree soups with cream, follow the guidelines discussed in the case of cream soups.

Puree soups can be made with dried or fresh beans such as peas, lentils, and navy beans, or with any number of vegetables including cauliflower, celery root, turnips and potatoes. Diced potatoes or rice are often used to help thicken vegetable puree soups.

Procedure for Making Puree Soups:

- Sweat the mirepoix in butter without browning.
- Add the cooking liquid
- Add the main ingredients and a sachet or bouquet garni.
- Bring to a boil, reduce to a simmer and cook until all the ingredients are soft enough to puree easily. Remove and discard the sachet or bouquet garni.
- Reserve a portion of the liquid to adjust the soup's consistency. Puree the rest of the soup by passing it through a food mill, food processor, blender or VCM.
- Add enough of the reserved liquid to bring the soup to the correct consistency. If the soup is still too thick, add hot stock as needed.
- Return the soup to a simmer and adjust the seasonings.
- Add hot cream to the soup if desired.

22.4.3 Veloutés: velouté as soups are similar to other sauces, but differ from purees, as they require a thickening element and a roux. Velouté is made by preparing roux and adding stock and the pureed vegetable or meat and hot milk is blended in, to produce as smooth soup.

Finishing of Veloutés is done by a liaison i.e. cream and egg yolks, as it enhance the taste and texture. Examples of Veloutés are Chicken velouté, celery velouté and almond velouté.

22.4.4 Bisques: Traditional bisques are shellfish soups thickened with cooked rice. Today bisques are prepared using a combination of the cream and puree soup procedures. They are generally made from shrimp, lobster or crayfish and are thickened with a roux instead of rice for better stability and consistency.

Much of a bisque's flavour comes from crustaceans shells, which are simmered in the cooking liquid, pureed (along with the mirepoix), returned to the cooking liquid and strained after further cooking. Pureeing the shells and returning them to the soup also adds the thickness and grainy texture associated with bisques.

Bisques are enriched with cream following the procedures for cream soups, and can be finished with butter for additional richness. The garnish should be diced flesh from the appropriate shellfish.

Procedure for Making Bisques:

- Caramelize the mirepoix and main flavouring ingredient in fat.
- Add a tomato product and deglaze with wine.
- Add the cooking liquid (stock or veloute)
- Incorporate roux if needed
- Simmer, skimming as needed.
- Strain the soup, reserving the solids and liquid. Puree the solids in a food chopper or processor and return them to the liquid. Return to a simmer.
- Strain the soup through a fine chinois or a china cap lined with cheesecloth.
- Return the soup to a simmer and finish with hot cream.

To add even more richness to the bisque, monte au beurre with whole butter or a compound butter such as shrimp or lobster butter just before the soup is served. Also, if desired, add 3 ounces (90 ml) of sherry to each gallon (4 lit) of soup just before service.

22.4.5 Chowders: An American soup resembling as stew made of meat, fish or vegetable with milk, salted pork and various seasonings. Crackers are generally added just before serving.

Chowders are hearty soups with chunks of the main ingredients (including, virtually always, diced potatoes) and garnishes. With some exceptions (notably, Manhattan clam chowder), chowders contain milk or cream. Although there are thin chowders, most chowders are thickened with roux. The procedures for making chowders are similar to those for making cram soups except that chowders are not pureed and strained before the cream is added.

Procedure for Making Chowders:

- Render finely diced salt pork over medium heat.
- Sweat mirepoix in the rendered pork

- Add flour to make a roux
- Add the liquid
- Add the seasoning and flavouring ingredients according to their cooking times.
- Simmer, skimming as needed
- Add milk or cream

22.4.6 Coulis: A term often used for thick soups made with a pure of shellfish, e.g. Coulis d'ecrevisses, Coulis de crabes. Sometimes the term also used for liquid purees such as chicken, game or vegetables

22.5 National and Regional Types

1. **Gumbo** : Gumbo is the pride of the state of Louisiana. It takes its name from African word 'okra', the ingredient that gives this soup its characteristic gelatinous structure.
2. **Avgolemono:** It **is** a soup made of rice cooked in meat broth. It is finished with well-beaten eggs and fresh lemon juice. This is from Greece
3. **Minestrone**: It is a Italian thick soup made of any vegetables available at the market.
4. **Mulligtwany**: It is a cream of curry soup which is considered to be a classical example of Indian national soup.

22.6 Cold Soups

Cold soups can be as simple as a chilled version of a cream soup or as unique as a cold fruit soup blended with yoghurt. Other than the fact that they are cold, cold soups are difficult to classify because many of them use unique or combination preparation methods. Regardless, they are divided here into two categories: cold soups that require cooking and those that do not.

Cooked Cold Soups: Many cold soups are simply a chilled version of a hot soup. For example, Consommé Madrilène and Consommé Portugaise are prepared hot and served cold. Vichyssoise, probably the most popular of all cold soups, is a cold version of puree of potato and leek soup. When serving a hot soup cold, there are several considerations:

- If the soup is to be creamed, add the cream at the last minute. Although curdling is not as much of a problem as it is with hot soups, adding the cream at the last minute helps extend the soup's shelf life.
- Cold soups should have a thinner consistency than hot soups. To achieve the proper consistency, use less starch in case starch is used as the thickener, or use a higher ratio of liquid to main ingredient if the soup is thickened by pureeing. Consistency should be checked and adjusted at service time.
- Cold dulls the sense of taste, so cold soups require more seasoning than hot ones. Taste the soup just before service and adjust the seasonings as needed.
- Always serve cold soups as cold as possible.

Uncooked Cold Soups: Some cold soups are not cooked at all. Rather they rely only on pureed fruits or vegetables for thickness, body and flavour. Cold stock is sometimes used to

adjust the soup's consistency. Dairy products such as cream, sour cream or crème fraiche are sometimes added to enrich and flavour the soup.

Because uncooked cold soups are never heated, enzymes and bacteria are not destroyed and the soup can spoil quickly. When preparing uncooked cold soups, always prepare small batches as close to service time as possible.

22.7 Garnishing Soups

Garnishes can range from a simple sprinkle of chopped parsley to tiny Profiteroles stuffed with foie gras adorning a crystal-clear bowl of consommé. Some soups are so full of attractive, flavourful and colourful foods that are integral parts of the soup (for example, vegetables and chicken or components) are necessary. In others, the garnish determines the type of soup. For example, a beef broth garnished with cooked barley and diced beef becomes beef barley soup.

Soup garnishes are divided into two types namely Garnishes in the Soup and Toppings.

22.7.1 Garnishes in the Soup: Major ingredients such as the vegetables in clear vegetable soup, are often considered as garnishes. This group of garnishes also includes meats, poultry, seafood, pasta products, and grains such as barley or rice. They are treated as part of the preparation or recipe itself, not as something added on.

Consommés are generally named after their garnish, such as consommé brunoise, which contains vegetables cut into brunoise shape.

Vegetable cream soups are usually garnished with carefully cut pieces of vegetables form which they are made.

22.7.2 Toppings: Clear soups are generally served without toppings, to let the attractiveness of the clear broth and the carefully cut vegetables speak for themselves. Occasional exceptions are topping of chopped parsley and chives.

Thick soups, especially those that are all one color, are often decorated with a popping. Toppings should be placed on just before service so that they won't sink or loose their fresh appearance. Their flavors must be appropriate to the soup. Do not overdo soup toppings. Few examples of toppings are;

Fresh herbs chopped

Sliced toasted almonds

Grated cheese

Croutons

Crumbled bacon

22.7.3 Guidelines for Garnishing Soups: Although some soups (particularly consommés) have traditional garnishes, many soups depend on the chef's imagination and the kitchen's inventory for the finishing garnish. The only rules are:

- The garnish should be attractive.
- The meats and vegetables used should be neatly cut into an appropriate and uniform shape and size. This is particularly important when garnishing a clear soup such as consommé, as the consommé's clarity highlights the precise (or imprecise) cuts.
- The garnish's texture and flavour should compliment the soup.

- Starches and vegetables used as garnishes should be cooked separately, reheated and placed in the soup bowl before the hot soup is added. If they are cooked in the soup, they may cloud or thicken the soup or alter its flavour, texture and seasoning.
- Garnishes should be cooked just until done; meat and poultry should be tender but not falling apart, vegetables should be firm but not mushy and pasta and rice should maintain their identity. These types of garnishes are usually held on the side and added to the hot soup at the last minute to prevent overcooking.

22.8 Soup Service

The standard portion size of soup is 6 oz in a soup or bouillon cup as part of a meal. Remember the golden rule “serve hot soup hot and cold soup cold”, while serving soups. Hot clear soups should be served near boiling point i.e., 210° F (99° C) is ideal. Hot cream soups should be served at slightly lower temperature; 190°-200°F (90°-93° C) is acceptable. Cold soups should be served at a temperature of 40° F (4° C) or below, and are sometimes presented in special serving pieces surrounded by ice.

The common accompaniments for the soups are bread rolls, bread sticks, cheese straws, corn chips and whole-grain wafers.

22.9 Conclusion

Soup, often served as the first course, may determine the success or failure of an entire meal. Although a wide variety of ingredients can be used to make both clear and thick soups, including trimmings and leftovers, poor quality ingredients make poor quality soups. By using, adapting and combining the basic techniques described in this chapter with different ingredients, one can create an infinite number of new and appetizing hot or cold soups. One must exercise good judgement when combining flavours and techniques; they should blend well and complement each other. However, any garnishes that are added should contribute to the appearance and character of the finished soup.

22.10 Self Assessment Questions

1. Define the term soup. Explain the preparation procedure of Consommé and Chowders?
2. How are soups classified? Give two examples of each and explain any two?
3. How does a consommé clarify?
4. List the four sub groupings of thick soups?
5. classify soups with a neat diagram. Discuss the preparation of cream soups?

22.11 References

1. Professional cooking 5th edition by Wayne Gisslen
2. The Art and Science of Culinary Preparation by Jerald W Chesser
3. Theory of Cookery by Krishna Arora

LESSON 23

Breads

23.0 Objectives

- To discuss historical progression of baking and to introduce baking as art and science
- To discuss various ingredients and their function in the baking process
- To make the learner familiar with the process of bread making and various methods of mixing doughs
- To discuss the common faults occur in bread making and their causes
- To explain the role bread improvers

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23.1 Introduction to Bakery

Baking has always been and will continue to be one of the most important and colorful areas of culinary development. The organized production of wheat by the Egyptians is considered be most historians to be the true beginning of the breads, which are produced today. Many centuries after the Egyptians, about 400bc, the Greeks were preparing more than fifty different kinds of breads. The Romans combined the knowledge of both the Greeks and the Egyptians and started producing bread in large scale in closed ovens.

It was during the rule of Augustus and Julius Caesar (100-44BC) that public bake shops were established in the Roman Empire. The knowledge of baking grew through experimentation and the influx of information from the new territories that were conquered giving birth to a new and thriving industry – BAKING.

These pastry and ice cream makers were called Patissier Dublayers. They were both pastry and bread specialists. With the advent of Americans and the influx of new ingredients like sugar (honeys was used till this time), cocoa, there was no limit for the pastry chef's magic. Famous pastry chefs during this period were

- Antonie Careme
- Urbain Dubios
- Jules and Julian Gouffe

In 1790, first school of baking opened in Paris. It is a field based solidly on history that must knowledge the baker and pastry chef as scientists as well as artists and, at all times, true professionals.

23.2 The Art and Science of Baking

"Bringing together a balanced quantity of various ingredients in a proper form". This is the definition of the Art and Science of baking. When you mix to blend many dry ingredients, liquids and leavenings together and exposed the mixture to heat, a variety of actions takes place and combines as one unit. For example;

Butter and sugar	-	melt
Egg	-	coagulates
Liquid	-	steam
Flour and starches	-	swell
Baking powder,		
Baking soda and yeast	-	form gases

It is very important to have a through knowledge about the role played each ingredient used in the preparation of fillings, icings, toppings, creams and doughs.

23.3 Basic Ingredients and their Functions in Baking Breads

Various ingredients and their performance determine the result of any bakery product. These ingredients generally can be grouped as:

- Flours
- Sugars and sweeteners
- Eggs
- Fats and oils
- Leavening agents

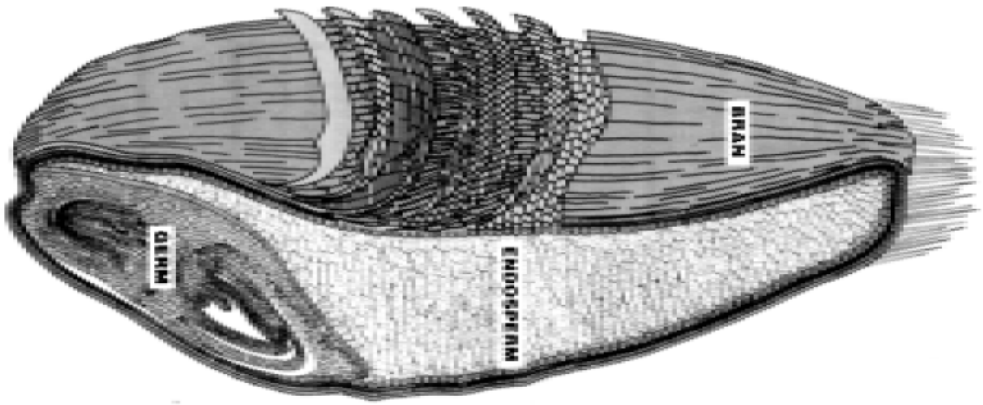
- Dairy products
- Spices
- Chocolate
- Salt

23.3.1 Flours: Wheat flour is the most important ingredient in the bakery. It provides bulk and structure to most of the baker's products, including breads, cakes, cookies and pastries. Wheat contains large amounts of gluten. Gluten is the elastic and sticky tough substance formed from the insoluble proteins of wheat flour during dough development. It is the gluten, which allows expansion of air cells within the dough as it warms. This is essential to a leavened product. Consequently, wheat makes better bread than other grains.

It is very important for a baker to know the structure of wheat kernel, to better understand the various types of flours available in the market and their functions. The wheat kernel consists of three main parts;

The bran is the hard outer covering of the kernel. It is present in whole wheat flour as tiny brown flakes, but is removed in the milling of white flour.

The germ is the part of the kernel that becomes the new wheat plant if the kernel is sprouted. Is has a high fat content that can quickly become rancid. Therefore, whole wheat flour containing the germ has poor keeping qualities.



Kernel of Wheat

The endosperm is the starchy part of the kernel that remains when the bran and germ are removed. This is the portion of the wheat kernel that is milled into white flour. Depending on its source, the wheat endosperm contains about 63 to 73% starch and 7 to 15% protein, plus small amounts of moisture, fat, sugar, and minerals.

Hard and Soft wheat: The characteristics of flour depend on the variety of wheat from which it is milled, the location in which the wheat is grown, and its growing conditions. The most important thing for the baker to know is that some wheat are hard and some are soft. Hard wheat contain grater quantities of the proteins called glutenin and gliadin, which together form gluten when the flour is moistened and mixed.

Strong flours-that is, flours from hard wheat with protein content are used primarily to make breads and other yeast products. **Weak flours** – that is, flours from soft wheat with low protein content are important in the production of cakes, cookies, and pastries.

Common **types of flours** used in bakery and patisserie are;

- **Straight flour**: Straight flour is flour made from the entire endosperm. After the bran, germ and shorts are removed, the endosperm is cracked and sifted several times to separate different grades of flour. If these grades, or streams, are recombined, the result is straight flour. Protein content of straight flour depends on the wheat; bit if made from hard wheat it may contain 13 to 15% protein.
- **Patent flour**: Patent flour is milled from the inner part of the endosperm, which breaks into finer particles than the part nearer the bran. Patent flour made from hard wheat is a strong flour of excellent quality and light, creamy color. When a formula for conventional bread calls for bread flour, patent flour is usually selected.

  Patent flours typically range form from 11 to 13% protein.
- **High-gluten flour**: Flour that has especially high protein content is sometimes used in hard-crusted breads and in such specialty products as pizza dough and bagels. It is also used to strengthen doughs made from that contain little or no gluten. Atypical high-gluten flour has 14% protein.
- **Cake flour**: Cake flour is a weak or low-gluten flour made from soft wheat. It has a very soft, smooth texture and a pure white color. Cake flour is used for cakes and other delicate baked goods that require low gluten content. Protein content of gluten flour is approximately 8 percent.
- **Pastry flour**: Pastry flour is also a weak or low-gluten flour, but it is slightly stronger than cake flour. It has the creamy white color of patent flour rather than the pure white of cake flour. Pastry flour is used for pie doughs and for some cookies, biscuits and muffins. Pastry flour has a protein content of about 9%.
- **All-purpose flour**: This is a mixture or blend of hard and soft wheat flour. This type of flour is usually used in home baking due to its versatility. It can be used for cake baking and all types of doughs. It has a protein content of about 11 to 11.5%
- **Whole wheat flour**: This is made by grinding the entire wheat kernel, including the bran and germ. The germ, is high in fat, which can become rancid, so whole wheat flour does not keep as well as white flour.

  Because it is made form wheat, whole wheat flour contains gluten - forming proteins, so it can be used alone in bread making. (Protein content is typically 12 to 13%) however, bread made with 100% whole wheat flour is heavier than white bread because the gluten strands are cut by the sharp edges of the bran flakes.

23.3.2 Sugars and Sweeteners: Sugars vary in their sweetening quality and are available in many forms – granulated sugar, castor sugar, icing sugar, lactose (milk sugar), can syrup, maple syrup, treacle, honey and golden syrup.

Low concentration of sugar speeds the effectiveness of baker's yeast by providing an immediate, fast cooking course of nourishment for its growth, thus hastening the leavening process.

Sugar gives puddings, breads and bread rolls a good flavor (caramel), the characteristic golden brown color, and a tender and oven texture.

Various **types of sugars** in detail are as follows:

- **Granulated sugar**: This sugar has been refined into crystals from either cane or sugar beets. Super line granulated sugar is preferred in baking because of its ability to dissolve faster in cake batters and other mixtures. It is often used for making meringues.
- **Powdered sugar**: This sugar is also known as confectioner's sugar. It has a very fine texture, the same as flour must always be sifted before adding to other ingredients. It should always be stored in an airtight container.
- **Raw sugar**: Raw sugar is less refined than other sugars, having a coarse lumpy texture. It has not been bleached and so retains its light brown to blonde color.
- **Brown sugar**: This is mostly sucrose (about 85 to 92%), but it is also contains varying amounts of caramel, molasses and other impurities, which give it its characteristic flavor. Brown sugars are available in light and dark colors. The darker grades contain more of these impurities. Basically brown sugar is regular cane sugar that has not been completely refined. However, it can also be made by adding measured amounts of these impurities to refined white sugar.
- **Demerara sugar**: It is a crystalline brown sugar. It is dry rather than moist like regular sugar. Demerara sugar is sometimes used in baking, but it is more often served as a sweetener with coffee and tea.
- **Honey**: Honey is natural sugar syrup consisting largely of the simple sugars glucose and fructose, plus other compounds that give it its flavor. Honeys vary considerably in flavor, depending on their source. Flavor is the major reason for using honey, especially as it can be expensive.

  Because honey contains invert sugar, it helps retain moisture in baked goods. Like molasses, it contains acid, which means it can be used when baking soda as a leavening.

- **Molasses**: This is a thick, brownish liquid byproduct derived from the refining of granulated sugar. The lighter the color, the sweeter the molasses. Molasses contains large amounts of sucrose and other sugars, including invert sugar. It also contains acids, moisture, and other constituents that give its flavor and color. Darker grades are stronger in flavor and contain less sugar than lighter grades.

  Molasses retains moisture in baked goods and, therefore, prolongs freshness. Crisp cookies made with molasses can become soft quickly because the invert sugars absorb moisture from the air.

- **Corn syrup**: Corn syrup is a liquid sweetener consisting of water, a vegetable gum called dextrin, and various sugars, primarily dextrose (also called glucose). Corn syrup is made by converting cornstarch into simpler compounds though the use of enzymes.

  Corn syrups are available with varying textures, intensities and flavors. It is used in cakes, icings, fruit fillings or toppings. The formula being used will indicate the type of corn syrup needed.

- **Maple syrup**: It is refined maple sap and has a rich, wonderful flavor. It is a highly prized product, which is very expensive. It is used as a topping for Danish pastries and special desserts and cakes.

Functions of sugar in baking:

1. They add sweetness and flavor.
2. They create tenderness and fineness of texture, partly by weakening the gluten texture.
3. They give crust color.
4. They increase keeping qualities by retaining moisture.
5. They act as creaming agents with fats and as foaming agents with eggs.
6. They provide food for yeast.

Sugar, when heated in water dissolves, then colors, upon further heating, turns brown and becomes a caramel. Sugar is changed into invert sugar.

Small thread	-	102° C	-	216° F	
Large thread	-	103° C	-	218° F	
Pearl	-	106° C	-	222° F	
Soft ball	-	114°-116° C	-	237° F -	for marzipan.
Ball	-	119° C	-	245° F -	for fondant.
Hard ball	-	120°-121° C	-	247° F -	for nougat.
Small crack	-	140° C	-	284° F -	for meringue.
Soft crack	-	143° C	-	290° F	
Hard crack	-	156°-160° C	-	312° F -	for pull sugar.
Caramel	-	163°-177° C	-	325° – 350° F.	

23.3.3 Eggs: Eggs, frozen or fresh, are used in large quantities in baking. There is nothing better in taste and performance than a fresh egg. Eggs used in cakes and soufflés serve as leavening agents; in sauces and custards as thickening agents, and in batters and doughs as a binding agent when they coagulate. The yolk is high in fat, protein and an emulsifier called lecithin. The baker values the yolk for the rich flavor and body, which it contributes to the baked product. The white is primarily composed of albumin protein, which is valued for its ability ton act as a binder and its ability to hold air to create light products.

One of the forms in which egg whites are often used by the baker is beaten. The manner in which the egg whites are to be used in the formula determines what amount of air is incorporated into them. There are three stages of beaten egg white;

- **Soft peak**: This is the first stage when air is added to the egg whites through the beating process until they become fluffy and creamy. If the recipe requires sugar, this is the point at which it has to be added.

- **Glossy peak**: It is the second stage which is achieved till the egg whites are beaten until they form glossy peaks when the beater is lifted from the bowl. Egg whites at this stage hold their shape and are stiff but not dry. This stage is the best time for egg whites to be folded into a soft batter. This stage is used for chiffon pies, mousses, soufflés, puddings, chiffon cakes and similar items.
- **Stiff peak**: This is the result of any continued beating after the second stage. This results in stiffer and larger peaks. This stage is generally used for meringues, pie toppings, frostings and similar items. Continued beating in excess of the third stage results in a dry, useless egg white. Any further addition of sugar or other products into the beaten egg whites should be done gently and carefully.

Note: Fold any ingredients into the egg whites with a large spatula to avoid breaking the fragile air cells, which have been beaten, into egg whites.

Functions of Eggs in Bakery:

- **Structure**: Like gluten protein, egg protein coagulates to give structure to baked products. This is especially important in high-ratio cakes, in which the high content of sugar and fat weakens the gluten.

  If used in large quantities, eggs make baked products more tough or chewy unless balanced by fat and sugar, which are tenderizers.
- **Emulsifying of fats and liquids**: Egg yolks contain natural emulsifiers that help produce smooth batters. This action contributes to volume and to texture.
- **Leavening**: Beaten eggs incorporate air in tiny cells or bubbles. In a batter this is trapped air expands when heated and aids in leavening.
- **Shortening action**: the fat in egg yolks acts as a shortening. This is an important function in products that are low in other fats.
- **Moisture**: Eggs are mostly water. This moisture must be calculated as part of the total liquid in a formula. If yolks are substituted whole eggs, for example, or if, dried eggs are used, adjust the liquid in the formula to allow for the different moisture content of these products.
- Flavor
- Nutritional value
- **Color**: Yolks impart a yellow color to doughs and batters. Also, eggs brown easily and contribute crust color.

23.3.4 Fats and Oils: Fats are used in confectionery to enrich the food and to impart to them shortening qualities. Collectively they are referred to as shortening agents. Their effect is to break down or destroy the toughness of gluten, so that instead off being hard and tough to eat, foods containing fat break off short and readily melt in the mouth.

Various fats used in bakery:

- **Butter**: Fresh butter consists of 80 to 82 percent of butterfat, 13 to 15 percent water, and 3 to percent milk solids. It is available salted or unsalted. It gives a beautiful flavor to the products.

- **Margarine**: It is made from a variety of vegetable and animal fats. Sources include groundnuts, palm, coconut and fish oils, and milk whey. It is composed of 80 to 82 percent fat, 13 to 15 percent water and 3to 5 percent milk solids plus salt, color, and flavor. It is normally used as a replacement for butter.
- **Vegetable shortenings**: These are derived from nuts, seeds and grains. Other name for vegetable shortenings is "specialty food fats". If needed for whipped toppings, cake batters or doughs, there is a specialty shortening designed. These shortenings are available as regular or plain with an emulsifier or with a stabilizer for shortenings or lower melting point.
- **Lard**: The fat of hogs has a unique flavor and makes a flaky pie crust.
- **Oil**: It is most often used in chiffon cakes, quick breads and soft roll doughs. It is also used for deep frying.

Functions of fats in bakery:

- To tenderize the product and soften the texture
- To add moistness and richness
- To increase keeping quality
- To add flavor
- To assist in leavening when used as creaming agents or when used to give flakiness to puff pastry, pie dough, and similar products.

Storage of Fats: All fats become rancid if exposed to the air too long. Also, they tend to absorb odors and flavors from other foods. Highly perishable fats, such as butter, should be stored, well wrapped, in the refrigerator. Other fats and oils should be kept in tightly closed containers in a cool, dry, dark place.

23.3.5 Leavening Agents:

1. **Baking Powder** : There are three basic types of baking powders
   - Double action – baking powder releases 1/3rd of its carbon dioxide at room temperature and the rest during baking.
   - Tartrate – baking powder reacts quicker, as soon as the liquid is added.
   - Phosphate – baking powder is slower and only heat releases its gases
2. **Baking Soda**: Baking soda is a chemical called sodium bicarbonate. It acts as a leavening agent, when mixed with an acid such as sour cream, sour milk, butter milk, molasses or citrus juice. The chemical reaction of the leavening agent and the acid produces gases which make the mixture rise. Baking soda is mainly used in cakes cocoa powder and chocolate.
3. **Yeast**: This is a tiny living fungus, which thrives on sweetness, warmth and moisture. Yeast releases gases that make bread dough rise, thus lightening the bread. Given sufficient time, yeast will not only make the dough rise, but also work on the gluten on the flour, to give it flavor as well as texture. A main factor for the effective use of yeast is the control of temperature. Compressed, fresh yeast should be dissolved at 100º-105 ºF milk or water. Dry yeast should be dissolved in 110 º-115 ºF milk or water. When using the newer types of instant yeasts follow the manufacturers' directions.

4. **Air**: Air is incorporated into a batter primarily by two methods; creaming and foaming. This air expands during baking and leavens the products.

   Creaming is the process of beating fat and sugar together to incorporate air. It is an important technique in cake and cookie making. Some pound cakes and cookies are leavened almost entirely by this method.

   Foaming is the process of beating eggs, with or without sugar, to incorporate air. Foams made with whole eggs are used to leaven sponge cakes, while angel food cakes, meringues, and soufflés are leavened with egg white foams.

5. **Steam**: When water turns to steam, it expands to 1,100 times its original volume. Because all baked products contain some moisture, steam is an important leavening agent.

   Puff pastry, cream puffs, and pie crusts use steam as their primary or only leavening agent. If the starting temperature for these products is high, steam is produced rapidly and leavening is greatest.

23.3.6 Milk: Milk and milk products are abundantly used in bakery and patisserie. Cream (heavy and light), milk (whole milk, low fat, skimmed and sweetened condensed milk) are used in bakery for the rich flavor that it provides.

Storage of milk products:

- Fresh milk and cream, buttermilk and other fermented milk products, and cheese must be kept in refrigerator at all times.
- Evaporated milk in unopened cans may be kept in a cool storage area. After, opening, store min the refrigerator. Condensed milk in large containers keeps for a week or more after opening if kept covered and in a cool place. The sugar acts as a preservative.
- Dried milk should be kept in a cool, dark place. It does not need refrigeration, although you should store it well away from ovens and other heat sources. Keep the container tightly closed to prevent the milk from absorbing moisture from the air.

23.3.7 Spices: Spices are plant or vegetable substances used to flavor foods. Plant part used as spices include seeds, flower buds (such as cloves), roots (such as ginger), and bark (such as cinnamon). Spices generally whole or ground. Ground spices lose their flavor rapidly, so it is important to have fresh spices always on hard. Keep them tightly sealed in a cool, dark, dry place.

Because a small amount of spice has a great deal of flavoring power, it is important to weigh spices carefully and accurately. A quarter ounce too much nutmeg, for example, could make a product inedible. In most case, it is better too use too little than too much.

- **Allspice**: The flavor of this item seems like a blend of cinnamon, nutmeg and cloves. It is found West Indies, used mainly in cakes, pies and cookies.
- **Anise**: Tiny oval seed of the parsley family having a licorice taste. Mainly found in Spain, Middle East and Mexico. It is used in pastries and cookies.
- **Caraway**: Tiny oval seed found all over the world. It is used in bread tools, cookies and a variety of other items.
- **Cinnamon**: Oldest of all the spices coming from the bark of a tree that grows in Indonesia, India and China. It is widely used in desserts, pastries and cookies.

- **Cloves**: Dried flower buds of a tropical tree of the myrtle family, used in cakes, puddings and a variety of other preparations.
- **Ginger**: Dried root of a tropical plant native to India, used in cakes, pies, puddings and other preparations.
- **Mace**: The husk of nutmeg is ground to a fine powder called mace and used primarily for sweet dough preparations.
- **Nutmeg**: An aromatic seed of a plant from East Africa, used inn numerous preparations including pies, cakes and cookies.
- **Poppy Seed**: This tiny, round, blue-back seeds of the poppy plant are used in bread rolls, and cookies.
- **Sesame Seeds**: These small white seeds, derived from the pods of a plant which grows in the Middle East and South America, are used for bread and cookies.

Spices should be purchased only in quantities, which can be used in a short period of time to ensure a fresh product, which can deliver its full flavor. Always premium brand spices only should be purchased.

23.3.8 Chocolate: Chocolate is made from roasted cocoa beans. This nibs or meat inside the beans are rich in cocoa butter. The heart created in the grinding process causes the cocoa to melt into a dark mass called chocolate liquor.

1. **Dark chocolate**: The most versatile chocolates are the dark, sweetened varieties; Bitter sweet, semi-sweet and sweet chocolate. Varying amounts of sugar are added to the chocolate liquor to create the three types of chocolate.
2. **Milk chocolate**: This chocolate contains more cocoa butter but less chocolate liquor compared with dark chocolate. It has a milder taste and a softer texture. It must contain 12% dry milk solids to meet government standards.

   Milk chocolate is a sweet chocolate to which milk solids have been added. It is usual used as a coating in various confectionary items.
3. **White cocoa butter coating**: White cocoa butter coating does not contain chocolate liquor that is why it cannot be called chocolate. This popular coating has a sweet, very mild chocolate flavor and is ideal for delicate desserts and decorative work.
4. **Compound coatings**: This product is frequently confused with white cocoa butter coatings and real chocolate. It is a flavored and colored compound which contains no cocoa butter. It is a vegetable oil based coating which cannot be considered chocolate. If soften contains palm kernel oil, sugar, dry milk solids, lecithin, flavoring, cocoa and food coloring.
5. **Cocoa butter**: This is natural fat contained within the cocoa bean.
6. **Unsweetened chocolate**: this is the dry pulverizes and nearly defatted chocolate liquor.
7. **Natural cocoa powder**: This is the dry, Pulverized and nearly defatted
8. **Dutch processed cocoa**: Cocoa powder of this type has been treated with alkalis.

9. **Coverture**: This term means 'coating'. It identifies the highest quality chocolates, those containing a large percentage of cocoa butter.

23.3.9 Salt: Common slat or table salt is used for bringing out the flavor of other ingredients which are used in cakes, and other products. Instead of reducing sugar in the cake formula, salt should be used as an adjustment of sweetness if the cake is too sweet. One of the functions of sugar is to retain the moisture in a cake, it is therefore, better to increase salt to tone down the excessive sweetness. Salt also lowers caramelization temperature of the cake batters and aids in obtaining crust color. Salt brings out the taste of other ingredients and helps to improve the flavor and characteristics of products.

Salt is a toughner. It helps to control in yeast raise doughs, the action of the yeast and thereby controls the rate of fermentation. Amount of salt to be used depends on several factors but mainly upon the type of flour. Weak flour will take more salt. The mineral content of water will also affect the amount of salt. When using hard water the amount of salt will need to be reduced, or as an alternative, add vinegar or edible acids. Under normal conditions, the amount of salt to use will range between 2 to 2.5%.

Characteristics of Salt:

- It should be completely soluble in water.
- It should give a clear solution. Cloudy solution will indicate presence of certain impurities. It should be free from lumps.
- It should be as pure as possible. It should be free from bitter or biting taste.

Functions of Salt: Basically salt has three functions in bread making

- It improves the bread flavor. It adds its own characteristic flavor and at the same time enhances the flavor of other ingredients in the bread.
- Salt strengthens and tightens the gluten in the flour. Salt inhibits the proteolyte proteins (enzymes) actions on gluten and helps in gluten development resulting in an even texture and flavor of the bread.
- If the salt is added in normal quantities as required, it has an inhibiting effect on the fermentation process of yeast and other ingredients will be beneficial when the temperatures for proofing the bread are not well controlled. The slat reduces the gassing power of the yeast, allowing the development of a more uniform rise in the product.

Too little salt can yield dough, which has too much volume and a shape lacking uniformity. Too much it proves disastrous. It will result in bread, which is dense with an underdeveloped volume. So a proper balance has to be achieved with respect to the amount of slay being added to achieve perfect bread. The best range of salt content in dough is 1½ to 4 percent of the flour weight.

23.4 Process of Bread Making:

The formula (or recipe) is the basis for all bread making. The proper development of the formula itself is the first step to a good finished product. There are many formulae readily available, or you may create your own. Whichever, once the formula is chosen it should be carefully followed.

There are many different formulas for bread and yeast-raised products. Some of these contain few or no enriching ingredients and are termed as lean dough. Others have a high percentage of ingredients like eggs, fat, and sugar, cream etc., these are called rich dough.

Lean Dough Products:

- Hard-crusted breads and rolls, including French and Italian breads, Kaiser Rolls and other hard rolls, and pizza are the leanest of all bread products.
- Other white and whole wheat breads and dinner rolls. These have a higher fat and sugar content and sometimes also contain eggs and milk solids. Because they are slightly richer, thy generally have soft crusts.
- Breads made with other grains. Rye breads are the most common. Many varieties of rye bread are produce, with light or dark flours or with pumpernickel flour, and with various flavorings, especially molasses and caraway seeds.

Rich Dough Products:

- Non sweet breads and rolls, including rich dinner rolls and brioche. These have a high fat content, but their sugar content is low enough to allow them to be served as dinner breads. Brioche dough, made with a high proportion of butter and eggs, is especially rich.
- Sweet rolls, including coffee cakes and many breakfast and tea rolls. These have high fat content and usually contain eggs. They generally have a sweet filling or topping.

There are 12 basic steps in the preparation of yeast breads. These steps are generally applied to all yeast products, with variations depending on the particular product.

- Weighing ingredients
- Mixing
- Fermentation
- Punching
- Scaling
- Rounding
- Benching
- Makeup and panning
- Proofing
- Baking
- Cooling
- Storing

23.4.1 Weighing Ingredients: All ingredients must be weighed accurately. Water, milk, and eggs may be measured by volume. They are scaled at 1 pt per pound or 1 kg per liter. Special care must be taken when measuring spices and other ingredients used in very small quantities.

23.4.2 Mixing: Mixing yeast dough has three main purposes;

- To combine all the ingredients into a uniform, smooth dough
- To distribute the yeast, evenly throughout the dough
- To develop the gluten

Four principal mixing methods are used namely straight dough method, salt-delayed method, no-time method and sponge dough method.

Rich dough products are generally under mixed slightly because a greater tenderness is desired for these products. Rye breads are also mixed less because of their weaker gluten, which tears easily.

Over mixing is a common error in bread making. Gluten that is developed too long has stretched nearly as far as it can and loses its elasticity. Then it tears instead of stretches, and molding is more difficult. The texture and volume of over mixed products are less desirable.

Salt used in proper quantities, helps alleviate this problem because it makes gluten stronger and more elastic.

23.4.3 Fermentation: Fermentation is the process by which yeast acts on the sugars and starches in the dough to produce carbon dioxide gas and alcohol.

Gluten becomes smoother and more elastic during fermentation, so it stretches farther and holds more gas. An under fermented dough will not develop proper volume, and the texture of the product will be coarse. A dough that ferments too long or at too high temperature become sticky, hard to work and slightly sour. An underfremented dough is called young dough, while overfremented dough is called as old dough.

Doughs with weak gluten, such as rye doughs and rich doughs, are usually under fermented or “taken to the bench young”.

Yeast action continues until the yeast cells are killed when the temperature of the dough reaches 140ºF (60ºC) in the oven. It is important to be aware that fermentation continues during the next steps in yeast dough production – punching, scaling, rounding, benching, and makeup or molding. Failure to allow for this time may result in over fermented doughs. Doughs that are to be made into rolls and loaves requiring a great deal of makeup time should be slightly under fermented to prevent the dough from being too old by the time makeup is completed.

23.4.4 Punching: Punching is not hitting the dough with your fist. It is a method of deflating the dough that

- Expels carbon dioxide
- Redistributes the yeast for the further growth
- Relaxes the gluten
- Equalizes the temperature throughout the dough

Additional fermentation and punching may or may not be necessary, depending on the product.

23.4.5 Scaling: Using a baker’s scale, divide the dough into pieces of the same weight, according to the product being made. During scaling allowance is made for weight loss due to evaporation

of moisture in the oven. This weight loss is approximately 10 to 13% of the weight of the dough. Allow an extra 1½ to 2 oz dough for each 1 lb baked bread, or 50 to 65 grams per 500 g.

Actual baking loss depends on baking time, size of the unit, and whether it is a pan or freestanding. Scaling should be done rapidly and efficiently to avoid overfermenting the dough.

23.4.6 Rounding: After scaling the pieces of dough are shaped into smooth, round balls. This procedure forms a kind of skin by stretching the gluten on the outside of the dough into a smooth layer. Rounding simplifies the laser shaping of the dough and also helps retain gases produced by the yeast.

23.4.7 Benching: Rounded portions of dough are allowed to rest for 10 to 20 minutes. This relaxes the gluten to make shaping the dough easier. Also, fermentation continues during this time.

In large operations, the rounded dough is placed in special proofers for this rest. Smaller operations place the dough in boxes that are stacked on one another to keep the dough covered. Or the dough may simply be placed on the workbench and covered – hence the term benching.

23.4.8 Makeup and Panning: The dough is shaped onto loaves or rolls and then placed in pans or on baking sheets. Hearth breads – breads baked directly on the bottom of the oven - may be placed in floured baskets or other molds after makeup.

Proper makeup or molding is of critical importance to the finished baked product. All gas bubbles should be expelled during molding. Bubbles left in the dough will result in large air holes in the baked product.

For both pan breads and hearth breads, the seam must be centered on the bottom to avoid splitting during baking. For units baked in pans, the pan size must be matched to the weight of the dough. Too little or too much dough will result in a poorly shaped loaf.

23.4.9 Proofing: Proofing is a continuation of the process of yeast fermentation that increases the volume of the shaped dough. Bakers use two different terms so they can distinguish between of the mixed dough and proofing of the make-up product before baking. Proofing temperatures are generally higher than fermentation temperatures.

Under proofing results in poor volume and dense texture. Over proofing results in coarse texture and some loss of flavor.

French bread is generally given a long proof to create its characteristic open texture. Its strong gluten withstands the extra stretching of a long proof.

Rich doughs are slightly under proofed because their because their weaker gluten structure does not with stand too much stretching.

23.4.10 Baking: Many changes take place in the dough during baking. The most important changes are;

- Oven spring, which is the rapid rising in the oven due to production and expansion of trapped gases as a result of the oven heat. The yeast is very active at first but is killed when the temperature inside the dough reaches 60ºC.
- Coagulation of proteins and gelatinization of starches. In other words, the product becomes firms and holds its shape.

- Formation and browning of the crust.

In order to control , the baking process, the following factors should be considered;

Oven temperatures and baking time: Temperatures must be adjusted for the product being baked. At the proper temperature the inside of the unit becomes completely baked at the same time that the crust achieves the desired color. Therefore:

1. Large units are baked at a lower temperature and for a longer time than small rolls spaced apart.
2. Rich doughs and sweet doughs are baked at a lower temperature because their fat, sugar and milk content makes them brown faster.
3. French breads made with no added sugar and a long fermentation requires very high temperatures to achieve the desired crust color.
4. Popular American lean breads are baked at 400º to 425ºF (205º TO 200ºC)
5. Some French breads are baked at 425º to 475ºF (220º TO 245ºC)
6. Rich products are baked at 350º to 400ºF (175º TO 205ºC)

A golden brown crust color is the normal indication of doneness, loaves that are done sound hollow when thumped.

Washes: Most of the yeast products are brushed with a wash before baking in order to improve the appearance of a finished baked product. The type of wash depends upon the intended use of the final product. Washes must always be appropriate for the product for which they are used.

1. **Water:** Water is often used on products, which, are needed to be hard-crusted, and if no or little steam is available. This helps in the steam production and results in the formation of hard crusted texture and browning in colour of the final product. Water is applied just before placing the product into the oven.
2. **Egg-wash:** This is also applied just before a product is being placed in the oven for baking. Care should be taken to apply egg wash evenly so that uniform browning can be achieved instead of streaky and highlighted browning. Egg wash is mainly used for Danish, coffee cakes and soft rolls. Two types of egg wash can be used-whole egg and egg white.
    - Whole egg: mixture is one egg to one cup of water.
    - Egg white: this is given at a ratio of three egg whites to one cup of water.

The only difference between the two washes is that the egg wash with white of egg brings less cholesterol and fat to the finished product.

3. **Sugar based glazes:** These are applied after baking. They give the product a high shine and help to seal in the moisture. For example, honey, sugar syrup glaze, fruit puree glazes like apricot glaze on a Danish or other sweet dough products.

Cutting or scoring: A break on the side of the loaf is caused by continued rising after the crust is formed. To allow for this expansion, the tops of hard-crusted breads are cut before baking. Slashes are made on the top of the loaf with a sharp knife immediately, before it is put into the oven. The pattern created by the cuts also contributes to the appearance of the bread.

Small rolls often bake completely without a break, so they are usually cut for the sake of appearance only.

Loading the ovens: Proofed doughs are fragile until they become set by baking. They should be handled carefully when being loaded into the ovens, and they should not be disturbed during the first part of baking. Breads and rolls are baked either directly on the bottom of the oven (hearth breads) or in pans.

Steam: Hard-crusted breads are baked with steam injected into the ovens during the first part of the baking period. Rye breads also benefit from baking with steam for the first 10 minutes.

The steam helps keep the crust soft during the first part of baking so the bread can expand rapidly and evenly. If steam were not used, the crust would begin forming earlier and thus would become thick and heavy. The steam also helps distribute the heat in the oven, further aiding oven spring. When the moisture of the steam reacts with the starches on the surface, some of the starches form dextrins. Then, when the steam is withdrawn, these dextrins along with sugars in the dough caramelize and turn brown. The result is a thin, crisp, glazed product.

Rich doughs, those with higher fat or sugar content, do not form crisp crusts and are usually baked without steam.

23.4.11 Cooling: After baking, bread must be removed from pans and cooled on racks to allow the escape of the excess moisture and alcohol created during fermentation. As soon as the breads are baked, they should be removed from the tray. The tray stays hot even when it is out of the oven for a short time, this heat prolongs the cooking of the rolls. This is termed as “Carry-over Cooking”, which results in drying the bread and can spoil perfect dough.

If soft crusts are desired, breads may be brushed with melted shortening before cooling.

23.4.12 Storing: Breads should be served within 8 hours may be left on racks. For longer storage, wrap cooled breads in moisture-proof bags to retard staling. Bread must be thoroughly cool before wrapping or moisture will collect inside the bags.

Wrapping and freezing maintains quality for longer periods. Refrigeration on other hand, increases staling.

Hard-crusted breads should not be wrapped (unless frozen), because the crusts will soften and become leathery.

23.5 Methods of Bread Mixing

23.5.1 Straight Dough Method: Mostly used by small retail bakeries. In this method;

- Yeast is combined with a portion of the water.
- The remainder of the water, salt, sugar and milk is placed in a mixing bowl.
- The flour is then added, and the mixture is mixed for one minute.
- Yeast solution is then added, and this mixture is mixed for one minute. Now, shortening is added, and the dough is kneaded for 10-15 minutes until it is smooth and elastic.

We note two features at this point:

- Firstly, the shortening is added last to prevent its interference with the incorporation of the yeast and to help in blending of all the ingredients.
- Secondly, the last mixing stage allows the gluten in the dough to stretch and develop to gain enough elasticity to allow the yeast to do its work later.

In making straight dough, after the dough has been mixed, it is customary to let the fermentation or rising to proceed until the mass has expanded to nearly full capacity. At the same time care should be taken that the dough should not over-rise.

Once the dough has been punched, it is then folded. The cooler portion of the dough is folded towards the center and the warm portion is pulled up and over. This process equalizes the temperature of the dough, retarding the continued fast action of the yeast for a short period. The dough will now be ready to be benched and formed.

- All the ingredients are mixed together, and the dough is fermented for a pre-determined time. The fermentation time depends on the strength of flour.
- Strong flours require more fermentation time to mature adequately. Flours that require 2 to 3 hours for maturing are normally used when bread is made in straight method.
- As temperature rise has immediate effect on fermentation speed, it is necessary to control the temperature of a straight dough by:
    a) Using shorter fermentation periods.
    b) Adjusting the temperature of doughing water.
    c) By fermenting the dough at optimum (room) temperature i.e., between 78º to 80º F.

23.5.2 Salt-Delayed Method:

- Slight variation of straight method, all ingredients are mixed except salt and fat.
- The speed of fermentation of the salt-less dough will be faster as salt has a controlling effect on the fermentation of yeast.
- Salt can be added at the knock-back stage directly or creamed along with fat and added.
- Whatever way is chosen; only $3/4^{th}$ (of the actual mixing time) mixing should be given initially and $1/4^{th}$ mixing at the time of adding salt.
- This method is suitable for strong flours. Due to the absence of salt in the initial stage, the fermentation speed is enhanced and gluten is matured in a reasonably shorter time.

23.5.3 No-Time Dough Method:

- In this method, dough is not fermented in the usual manner. Just allowed a brief period (about 30 min) to recover from the strains of mixing.
- As dough is not given enough time to ferment, the twin functions of fermentation i.e., production of gas and the conditioning of gluten are achieved to an extent by increasing the quantity of yeast (2 to 3 times of the original quantity) and by making the dough a little slacker and warmer.

- This method is normally followed if bread is made in emergency. Though it results in a fairly acceptable quality, bread made in this manner has poor keeping quality and lacks in aroma. Also the bread may have a strong yeast flavour.

23.5.4 Sponge Dough Method:

- Sponge dough is used for large quantity bread production only. It produces very tightly textured, sponge bread. This dough is normally done in two stages:

  a) The yeast is dissolved using the full amount of liquid. Then part of the sugar and flour are also added to this mixture. This combination is mixed to a thick batter or very soft dough. The mixture is covered and allowed to ferment until at least double in size.

  b) The mixture is then punched (this is the pushing of the dough mixture down to release part of the carbon dioxide which has developed). The remaining ingredients are added, making a uniform smooth dough.

- Fermentation can be done in many ways. A long fermentation of 5 to 6 hours at a controlled temperature of 75 F or lower improves the flavour and texture of your final product greatly.

- As with the straight dough, this dough is punched and folded when fermentation is completed. It is then ready to bench and form.

For all the doughs, control of fermentation is the key. Otherwise, the result will be a young or an under ripe dough, or an over ripe old dough. Balance of ingredients, mixing, temperature and time are very important.

23.6 Bread Faults and their Causes

Because of the complexity of the bread making, many things can go wrong. To remedy common bread faults, check the following troubleshooting guide for possible causes.

Shape

Poor Volume	Use of weak flour
	Too much salt
	Lack of shortening
	Yeast dissolved in hot water
	Too much or not enough dough for the mixture
	Under mixing
	Over mixing
	Young dough
	Extremely old dough
	Too long proofing

	Insufficient pan proof
	Excessive steam pressure
	Oven too hot
Too much volume	Not enough salt
	Use of wrong type of flour
	Dough slightly over aged
	Too much dough for pans
	Over proofing
	Cool oven
Poor shape	Too much liquid
	Flour too weak
	Improper molding or makeup
	Too much oven steam
	Improper fermentation or proofing

Flavor

Flat taste and poor flavor	Improper storage of ingredients
	Poor quality ingredients
	Off-flavored ingredients
	Improper amount of salt
	Under fermented dough
	Old dough
	Unsanitary shape
	Dirty pans
	Under baking
	Over baking
	Bread cooled under unsanitary condition

Texture and Crumb

Crumb is gray	Use of too much salt
	Old dough
	Excessive proofing
	Pan too large for the amount of dough

Streaked Crumb	Improper incorporation of ingredients
	Sponge or dough crusted over during fermentation
	Sponge not broken up properly
	Excessive tough grease
	Scrap dough picked up during makeup
	Excessive use of divided oil
	Excessive dusting flour
	Dough crusted during intermediate proof
	Rough handling at oven
Coarse grain	Weak flour
	Improper mixing
	Slack dough
	Young dough
	Old dough
	Improper dough
	Excessive proof
	Rough handling at oven
	Cool oven
Poor Texture	Weak flour
	Lack of shortening
	Improper mixing
	Slack dough
	Excessive trough grease
	Young dough
	Old dough
	Excessive use of divider oil
	Excessive dusting flour
	Improper molding
	Cool oven
Holes in bread	Unbalanced formula
	Flour too strong
	Improper incorporation of ingredients

	Under mixing
	Over mixing
	Excessive trough grease
	Young dough
	Old dough
	Excessive use of divider oil
	Excessive dusting flour
	Proof box hot
	Over proofing
Crust	
Color too pale	Too lean formula
	Flour lacking activity
	Excessive mineral yeast
	Old dough
	Insufficient humidity proof box
	Cool oven
	Under baking
Crust too dark	Too much sugar
	High milk content
	Old dough
	Oven too hot
	Over baking
Blisters under the Crust	Young dough
	Excessive steam in proof box
	Over proofed
	Rough handling at oven
Crust too thick	Insufficient shortening
	Low sugar content
	Old dough
	Lack of moisture in proof box
	Excessive steam in proof box
	Cool oven
	Over baking

Storage

Poor keeping qualities	Too lean formula
	Poor quality ingredients
	Improper storage of ingredients
	Old dough
	Over proofing
	Cool oven
	Bread cooled too long before wrapping

In checking these faults, an analysis of the various causes will show inferior ingredients. Unbalanced formulas, improper mixing, incorrect fermentation time, poor control of temperature, time and humidity throughout the production process, poor make-up procedures, poor oven conditions as well as improper handling in cooling, wrapping and stepping account for most of the bread faults. A process of elimination must be instituted, the possible cause or causes determined, and the proper remedy applied.

23.7 Varieties of Bread

Rye bread	Whole wheat bread	French bread
White bread	Cracked wheat bread	Raisin bread
Water bread	Pumpernickel bread	Garlic bread
Brioche bread	German caraway bread	Cheese bread
Oatmeal bread	Bran and Honey bread	Herb bread
Cornell bread	Raisin and Nut bread	Colonial bread
Graham bread	Christmas bread	Swedish bread

Whatever the type of bread is made, the principles of bread baking are the same. Different formulas are tried and experimented to produce new products but it should always be noted to know the formula perfectly and to follow the instructions given to achieve a good final product.

23.8 Latest Trends and Products

Not every bakery has the equipment, space or staff needed to produce bread from the scratch. Bakers have to be aware of the latest products and raw materials available in the market and also the various convenience products, which help in reducing a lot of time and effort and at the same time, give the desired products. There are nowadays several companies, which have developed a variety of frozen bread and roll products. These products are generally made out of a young bread dough that has risen only once. Then they are made into individual pieces appropriate for the intended final product and are individually quick frozen (I.Q.F). These are packed and then stored in holding freezers. These products are also called as “proof and bake” products as many of these require a final proofing before baking. There are also products, which are proofed and

just need baking. If handled properly, these products result in a good end result and also help in saving a lot of space, time and staff.

23.9 Bread Improvers

If the quality of the raw material is good and the baker knows his job well, it is hardly necessary to use bread improvers. However, ideal condition for bread production always does not exist. Quality of flour varies from consignment to consignment, mineral contents of water varies from place to place, and with complete mechanization of bread production process, it has become unavoidable to make use of certain chemicals in order to ensure consistently good quality of the product.

Gluten forming proteins of the flour is the basic factor for making good bread. Strength and extensibility of gluten are the two main characteristics responsible for bread making quality of flour. Flour always does not contain desirable quality of gluten forming proteins. Any added material, which can improve the strength and extensibility of flour, is known as **bread improver.**

The followings can be added as Bread Improvers;

Mineral Yeast Food (MYF or Inorganic salts), Potassium bromide, Calcium Peroxide and Ammonium chloride are used in a ratio with the flour as improver. Ascorbic acid (Vitamin C) is a very good bread improver, which has a milder oxidizing action on gluten than Potassium bromide. It has extremely beneficial effect on texture of bread, making it soft and silky. It can be used at a rate of 15 to ppm. For emergency requirements, it can be purchased from local chemists shop in the form of tablets of definite weight, although is should not be made a regular practice, and supplies in pure form should be ordered with chemical suppliers.

Milk, malt, fat, sugar, eggs, soya flour are natural bread improvers.

23.10 Conclusion

This brief introduction to the history, basic terms and concepts of baking has laid the foundation for what is to follow. It is intended only to be an introduction, a taste as it were of the true flavor of baking.

Bread baking is uniquely satisfying. It is art and science involving patience, creativity and an intuitive feeling for the constantly changing texture of the dough. There is a sense of mystery in watching basic ingredients like flour, water, sugar and salt respond to the magical power of yeast to lift and expand, maturing according to its own timetable, not yours. If you are baking your own bread, produce it in small quantities, which can be used each day. Not only does this relieve the problem of waste due to drying and molding, it will also insure that your customers have the pleasure of eating freshly baked bread. This truly the magic in any great meal.

23.11 Self Assessment Questions

1. What are different types of mixing dough? Explain briefly?
2. Explain the different stages of sugar when melted and its application in bakery?
3. What is role of leavening agents in bakery products?

4. What are the faults and remedies while making bread?
5. List four types of fats and oils used in baking?
6. Discuss the various types of leavening agents?
7. Discuss the process of bread making?
8. List and discuss the two types washes used in bread making?

23.12 References

1. The Art and Science of Culinary Preparation by Jerald W. Chesser
2. Professional Baking 4th Edition by Wayne Gisslen

LESSON 24

Cakes

24.0 Objectives:

- To introduce cakes as a category of baking production
- To discuss the ingredients used in cakes and their function
- To explain the preparation of cakes
- To discuss common faults and the causes in make making process.

Contents

24.1 Introduction

Cakes are the richest and sweetest of all the baked products. From the baker's point of view, point of view, producing cakes requires as much precision as producing breads, but for completely opposite reasons. Breads are lean products that require strong gluten development and careful control of yeast control of yeast action during the ling fermentation and proofing periods.

Cakes, on the other hand, are high in both fat and sugar. The baker's job is to create a structure that supports theses ingredients and yet to keep it as light and delicate as possible. Fortunately, producing cakes in quantity is relatively easy if the baker has good, well-balanced formulas, scales ingredients accurately., and understands basic mixing methods well.

Cakes owe their popularity not only to their richness and sweetness but also to their versatility. Cakes can be presented in many form, from simple sheet cakes in cafeterias to elaborately decorated works of art for weddings and other important occasions. With only a few basic formulas and a variety of icings and fillings, the chef or baker can construct the perfect dessert for any occasion or purpose.

24.2 Ingredients

The ingredients used in most cakes are flour, sugar, shortening or butter, eggs, salt and leavening. The ingredients may vary in kind, quantity and method used. Again, it is important that you, as the baker, understand and recognize the function of the ingredients in various cake formulas.

1. **Flour**: Most cake formulas call for bleached soft wheat flour. This flour produces fine cell structure, fine again and smooth texture. The low protein, soft wheat flour is essential to quality production. It reduces the possibility of toughness developing. Hard wheat flour by contrast, contains more gluten and produces a coaster textured cake.

2. **Sugar**: Sugar serves three purposes in the cake mixture. It sweetens; tenderizes, and moistens. Sugar tenderizes by softening the flour protein and starches in the cake mix. It helps retain moisture in baked cakes, making them moist and edible after several days. the types of sugars used often in cake recipes are granulated sugar, brown sugar and molasses. Molasses is used in gingerbread or spice cakes to add flavor enhances flavor and, like molasses, increases moisture retention.

3. **Fat**: cakes may contain butter, margarine, hydrogenated shortening compounds (with or without emulsifiers added) or oil. The function of fat or oil, in cake is to lubricate its internal structure. They aid in the incorporation and holding of air and moisture, allowing production of a tender product. To fulfill this f\unction, fats must be thoroughly mixed and dispersed throughout the batter.

   Butter and hydrogenated shortening compounds are easily mixed and yield cakes of maximum volume. Hydrogenated shortening may contain an ingredient known as an emulsifier. This aids the distribution of fat in a mixture, enabling the baker to obtain a cake that is of large volume, fine grain and pleasing moistness.

4. **Salt**: The main purpose of salt in cake baking is its effect on the taste and flavor of the baked product. It brings out the flavor of all other ingredients. Too high a level of salt content will create an unpleasant flavor.

5. **Egg**: The egg used in cake baking serves a number of purposes. It contributes to cake structure by working with the gluten in the flour. Egg binds and helps stabilize the batter. Whipped egg holds air and allows it to expand during baking, supplying dome leavening action. Egg also acts as an emulsifying agent, because of the lecithin in the yolks, a natural emulsifier. Moisture, color, flavor and eating quality are all contributions of the egg in cake baking.

   Because eggs are a major ingredient in cake baking, it is important that the quality and quantity be consistently precise. Although fresh eggs are best, they vary in size. The yield of a given amount of fresh eggs can differ greatly. Always weigh the fresh eggs broken out of the shell for use in cakes. Frozen whole eggs should be properly thawed; thoroughly stirred, and then weighed.

6. **Liquid**: Liquid is needed to combine and activate other ingredients. It is the primary control for the consistency of the finished cake batter. Milk, juice, liqueurs or coffee can be used as the liquid in cake baking.

7. **Leavening**: Cakes can be leavened in three ways; incorporation of air during mixing, chemical leavening agents such as baking powder and vapor pressure created in the oven. The kind of leavening agent used depends on the richness of the formula, consistency of the batter and baking temperature. All three leavening agents produce the lightness or porousness, which gives cake their characteristic texture.

   Incorporated Air: Air is normally incorporated into the cake batter during mixing. How much air is incorporated will depend on many factors. How many times the flour is sifted, the speed of hand or machine mixing, the mixing method and tools used, all affect the incorporation of air. Another factor is the temperature of the cake batter.

   Baking powder is the most common chemical leavening agent used in cake baking. It liberates carbon dioxide gas when it comes in contact with a liquid. The amount and speed with which it releases gas depends on type of baking powder used.

   Baking soda is used in many cake formulas. It is used to generate carbon dioxide gas and contributes to the lightness of the cake. When baking soda is the only leavening used, the formula must also contain a moist acid ingredient. It is the combination of soda and moist acid which produces carbon dioxide gas. Sour milk, vinegar, buttermilk, sour cream and molasses are commonly used in this manner.

   Vapor or steam: Some leavening action is produced by steam or vapor given off by the liquid in the cake batter mixing during baking. As the steam is released, it expands the cells developed in the cake's structure, pushing the cake up.

24.3 Cake Mixing Methods

24.3.1 Creaming Method: This method, also called conventional method, was for a long time the standard method for mixing high-fat cakes. The development of emulsified, or high-ratio, shortenings led to the development of simpler mixing methods for shortened cakes containing amounts of sugar and liquid. The creaming method is still used fir many types of butter cakes.

Procedure:

1. Scale ingredients accurately. Have all ingredients at room temperature.
2. Place the butter or shortening in the mixing bowl. With the paddle attachment, beat fat slowly until it is smooth and creamy.
3. Add the sugar; cream the mixture at moderate speed until the mixture is light and fluffy. This will take about 8 to 10 minutes.
   - Some bakers prefer to add the salt and flavorings with the sugar to ensure uniform distribution.
   - If melted chocolate is used, add it during creaming.
4. Add the eggs a little at a time. After each edition, beat until the eggs are absorbed before adding more. After the eggs are beaten in, mix until light and fluffy. This step will take about 5 minutes.
5. Scrape down the sides of the bowl to ensure even mixing.

6. Add the sifted ingredients, alternating with the liquids. This is done as follows;
    - Add ¼of the dry ingredients. Mix just until blended in.
    - Add S! of the liquid. Mix just until blended in
    - Repeat the above process until all ingredients are used.
    - The reason for adding dry and liquid ingredients alternately is that the batter may not absorb all the liquid unless some of the flour is present.

24.3.2 Two-stage method: This mixing was developed for use with modern high-ratio shortenings. High-ratio cakes contain a large percentage of sugar, more than 100% based on the weigh of the flour. Also, they are made with more liquid than creaming-method cakes, and the batter pours freely. The mixing method is a little simpler than the creaming one, and it produces a smoother batter that bakes up into a fine-grained, most cake. It gets its name because the liquids are added in two stages.

Because the two-stage batter always contains shortening and not butter, the flavor of the cakes is not as rich as that of the butter cakes. Two-stage or high-ratio cakes are prepared most often in high-volume bakeries.

Procedure:

1. Scale ingredients accurately. Have all ingredients at room temperature.
2. Sift the flour, baking powder, soda and salt into the mixing bowl and add the shortening. With the paddle attachment, mix at low speed for two minutes. Stop the machine, scrape down the bowl and beater, and mix again for 2 minutes.
    - If melted chocolate is used blend it now.
3. Sift the remaining dry ingredients into the bowl and add part of the water or milk. Blend at low speed for 3 to 5 minutes. Scrape down the sides of the bowl and beater several times to ensure even mixing.
4. Combine the remaining liquids and lightly beaten eggs. With the mixer running, add this mixture to the batter in three parts. After each part, turn off the machine and scrape down the bowl. The finished batter is normally quite a liquid.

24.3.3 Flour-Batter Method: This method produces a fine-textured cake, but there may be some toughening due to the development of gluten. Flour-batter cakes include those made with either emulsified shortening or butter or both.

Procedure:

1. Scale all ingredients accurately. Have all ingredients at room temperature.
2. Sift the flour and other dry ingredients except the sugar into the mixing bowl. Add fat. Blend together until smooth and light.
3. Whip the sugar and eggs together until thick and light. Add liquid flavoring ingredients, such as vanilla.
4. Combine the flour-fat mixture and the sugar-egg mixture and mix until smooth.
5. Gradually add water or milk (if any) and mix smooth.

24.3.4 Sponge Method: Although there are main types of sponge cakes, they all have one characteristic in common: they are made with egg foam that contains yolks. These are usually whole-egg foams but, in some cases, the base foam is yolk foam, and an egg white foam is folded in at the end of the procedure.

In its simplest form sponge cake batter is made in two basic steps;

- Eggs and sugar are whipped to a thick foam, and
- Sifted flour is folded in.

Additional ingredients such as butter, liquid, complicate the procedure slightly.

Procedure:

1. Scale ingredients accurately.
2. Combine the eggs, sugar, and salt in a stainless steel bowl. Immediately set the bowl over a hot water bath and stir or beat with a whip until the mixture warms to a temperature of about 43ºC (110ºF).
3. With a wire whip or the whip attachment of a mixer, beat the eggs at high speed until they are very light and thick.
4. If any liquid (water, milk, liquid flavoring) is included, add it now. Either whip it in a steady stream or stir it in, as indicated in the recipe.
5. Fold in the sifted flour in three of four stages, being careful not to deflate the foam. Many bakers do this by hand, even in large batches. Fold gently until all the flour is blended in. If any other dry ingredients are used, such as cornstarch or baking powder, they should first be sifted with the flour.
6. Immediately pan and bake the batter. Delays will cause loss of volume.

24.3.5Angel Food Method: Angel food cakes are based on egg-white foams and contain no fat. Egg whites for angel food cakes should be whipped until they form soft, not stiff peaks. Over whipped whites lose their ability to expand and to leaven the cake.

Procedure:

1. Scale ingredients accurately. Have all room temperature. The egg whites may be slightly warmed in order to achieve the better volume.
2. Sift the flour with half of the sugar. This helps flour mix more evenly with the foam.
3. Using whip attachment beat the egg whites until they form soft peaks.
4. Add salt and cream of tartar near the beginning of the beating process.
5. Gradually beat in the portion of the sugar that was not mixed with the flour. Continue to whip until the whites form soft, moist peaks. Do not beat until stiff.
6. Fold in flour-sugar mixture just until it is thoroughly absorbed, but no longer.
7. Deposit the mix in ungreased pans and bake immediately.

24.3.6 Chiffon Method: Chiffon cakes and angel food cakes are both based on egg-white foams, but here the similarities in the mixing methods end. In angel food cakes, a dry flour-sugar mixture is folded into the egg whites. In Chiffon cakes, a batter containing flour, egg, yolks, vegetable oil, and water is folded into whites.

Egg whites for chiffon cakes should be whipped until they are a little firmer than those angel food cakes, but do not whip them until they are dry. Chiffon cakes contain baking powder, so they do not depend on the egg foam for all their leavening.

Procedure:

1. Scale ingredients accurately. Have all at room temperature. Use a good quality, flavorless vegetable oil.
2. Sift the dry ingredients, including part of the sugar, into the mixing bowl.
3. Mixing with the paddle attachment, gradually add the oil, then the egg yolks, water and liquid flavorings, all in a slow, steady stream. While adding the liquids, stop the machine several times and scrape down the bowl and the beater. Mix until smooth, but do not over mix.
4. Whip the egg whites until they form soft peaks. Add the cream of tartar and sugar in a stream and whip top firm, moist peaks.
5. Fold the whipped egg whites into the flour-liquid mixture.
6. Immediately deposit the batter in ungreased center-tube pans (like angel food cakes) or in layer pans that have had the bottoms greased and dusted, but not the sides (like sponge layers).

24.4 Cake Formulas

It is possible to change cake formulas, either to improve or to reduce costs. However, ingredients and quantities can be changed only within certain limits. A cake formula in which the ingredients fall within the limits is said to be in balance. Knowing these limits helps to you not only modify recipes but also judge untested recipes and correct faults.

Ingredient Functions: For the purpose of balancing cake formulas, we can classify cake ingredients according to four functions: tougheners, tenderizers, driers, and moisteners. The idea of formula balancing is that tougheners should balance tenderizers and driers should balance moisteners. In other words, if we increase the amount of tougheners in a formula, for example, we must compensate by also increasing the amount of tenderizers.

Many ingredients fill more than one function, sometimes even opposite functions. Egg yolks contain protein, which is a toughener, but they also contain fat, which is a tenderizer. The major cake ingredients are classified as follows:

- **Tougheners** provide structure – floor, eggs (white and yolks)
- **Tenderizers** provide softness or shortening of protein fibers - sugar, fats
- **Moisteners** provide moisture or water – water, liquid milk, syrups and liquid sugars, eggs.
- **Driers** absorb moisture – flours and starches, cocoa, milk solids

You can also use this table of ingredients as a troubleshooting guide for cake failures. A cake that fails even if mixed and baked correctly may require formula balancing. For example, if a cake is too dry, you might increase one or more of the moisteners or decrease the driers.

This takes a certain amount of experience, however, remember that most ingredients have more than one function. If you decide to increase the eggs in a dry cake, you may wind up with an even harder, tougher cake. Although whole eggs do provide some moisture, they provide even more toughening power because of their strong protein content.

24.5 Panning, Baking and Cooling

24.5.1 Panning: Prepare pans before mixing cake batters so cakes can be baked without delay as soon as they are mixed.

- For high-fat cakes, layer pans must be greased, preferably with a commercial pan-greasing preparation. If this is not available, dust the greased pans with flour and tap out the excess.
- For sheet cakes, line the pans with greased parchment. For thin layers, such as Swiss rolls, it is necessary to use level pans without dents or wraps.
- For angel food cakes and chiffon cakes baked in tube pans, do not grease the pan. The batter must be able to cling to the sides so it doesn't sink back into the pan after rising.
- For sponge cake layers with little layers or no fat, grease the bottoms but do not the sides of the pans.

24.5.2 Baking: Cake structure is fragile, so proper baking conditions are essential for high-quality products. The following guidelines will help you avoid cake failures.

1. Preheat the ovens. To conserve expensive energy, don't preheat longer than necessary.
2. Make sure ovens and shelves are level.
3. Do not let pans touch each other. If pans touch, air circulation is inhibitated and the cakes rise unevenly
4. Bake at correct temperature
    - Too hot an oven causes the cake to set unevenly with a humped center, or to set before it has fully risen. Crusts will be too dark.
    - Too slow an oven causes poor volume and texture because the cake doesn't set fast enough and may fall.
5. If steam is available in the oven, use it for creamed and two-stage batters. These cakes bake with a flatter top if baked with steam because the steam delays the formation of the top crust.
6. Do not open the oven or disturb cakes until they have finished rising and are partially browned. Disturbing the cakes before they are set may cause them to fall.

Baking Times and Temperatures for the Cakes		
Size	**Temperature**	**Approximate Time**
6-8 inches	365°F	18-25 Minutes
9-12 inches	350°F	25-40 Minutes
14 inches	350°F	35-45 Minutes
2.22x2.5x8 inches	350°F	45-55 Minutes
18x26 inches	365°F	20-25 Minutes

Tests for doneness:

- Shortened cakes shrink away slightly from sides of pan.
- Cake is springy. Center of top of cake springs back when pressed lightly.
- A cake tester or wooden pick inserted in center of cake comes out clean.

24.5.3 Cooling: Cool layer cakes and sheet cakes 15 minutes in pans and turn out while slightly warm. Because they are fragile, they may break if turned out when hot.

Turn out layer cakes onto racks to finish cooling

To run out sheet cakes:

- Sprinkle top lightly with granulated sugar
- Set an empty sheet pan on top, bottom-side down.
- Invert both pans
- Remove top pan
- Peel parchment off cake.

Cool angel food cakes and chiffon cakes upside down in pans so they do not fall back into the pans and loss of volume. Support the edges of the pan so the top of the cake is off the bench. When cool, loosen the cake from sides of the pan with a knife or spatula and carefully pull out the cake.

24.6 Storage

As with most baked products, cakes taste better when they are fresh, no more than a day or two old. However, if you plan to keep a cake for several days, wrap it well in foil or plastic wrap. A cake, even when well covered, should only be stored for a few days in the refrigerator. Not only will it absorb odors and flavors, it will also dry out.

For long term storage of cakes, freezing is best. Almost all cakes freeze well. They should \be wrapped tight before freezing to prevent the “freezer burn” that results when air gets into the wrapping. Cakes can be frozen with or without frosting. However, it is easier to freeze them without frosting.

Defrost cakes at room temperature for one to two hours. If they are unfrosted, let them thaw completely before unwrapping. This will prevent drying caused by exposure to the air. However,

if the cake is frosted, it is best to unwrap it before thawing. This will prevent unnecessary build-up of moisture between the wrapping and the frosting.

24.7 Faults and their Causes:

Errors in mixing, scaling, baking, and cooling cakes cause many kinds of defects and failures. For easy reference, these various defects and their possible causes are summarized in the troubleshooting guide.

Volume and Shape	
Poor volume	Too little flour
	Too much liquid
	Too little leavening
	Oven too hot.
Uneven shape	Improper mixing
	Batter spread unevenly
	Uneven oven heat
	Oven racks not level
	Cake pans warped
Crust	
Too dark	Too much sugar
	Oven too hot
Too light	Too little sugar
	Oven not hot enough
Burst or cracked	Too much flour or flour too strong
	Too little liquid
	Improper mixing
	Oven too hot
Soggy	Under baked
	Cooling in pans with not enough ventilation
	Wrapping before cool
Texture	
Dense or heavy	Too little leavening
	Too much liquid
	Too much sugar
	Too much shortening
	Oven not hot enough
Coarse or irregular	Too much leavening
	Too little egg
	Improper mixing

Crumbly	Too much leavening
	Too much shortening
	Too much sugar
	Wrong kind of flour
	Improper mixing
Tough	Flour too strong
	Too much flour
	Too little sugar or shortening
	Over mixing
Poor flavor	Poor quality ingredients
	Poor storage or sanitation
	Unbalanced formula

24.8 Conclusion

The preparation of quality cakes requires attention to details. The function of the various ingredients, the method of bringing the mixture together and the temperature at which the cake is baked are each crucial factors in cake preparation. When the details are properly handled, the results can be marvelous for both the chef and the guests. The variety of textures, light as air to sinfully rich and heavy, bring enrichment to a meal. The simplicity or the complexity of the flavors are exciting to the mind and the palate. Possibly only thing is that is better than a finely prepared cake topped with an appropriate icing.

24.9 Self Assessment Questions

1. What are the different methods of making cake and explain any two methods?
2. Discuss the leavening agents of cakes?
3. What are the common faults and their causes while making cake?
4. List and discuss various types of leavening agents?
5. List the steps in the creaming method of cake making?

24.10 References

1. The Art and Science of Culinary Preparation by Jerald W. Chesser
2. Professional Baking 4th Edition by Wayne Gisslen