

Learning Objectives

In this chapter the student will

- Understand the diverse functions of food
- Gain knowledge of the various food sources and the different nutrients present in them
- Understand concepts of the basic four food groups, food guide pyramid and "my plate"
- Get familiar with the different cooking methods
- Learn the methods of enriching food
- Learn about various kitchen equipment required for cooking
- Know about techniques that would ensure safety in the kitchen



3.1 INTRODUCTION

Food has been a necessity for human survival since the very beginning of the world. Food is required for every living creature. Good food is reflected by optimum health and wellbeing. In early times



— Ralph Waldo Emerson

man ate food most naturally. Fruits, vegetables, cereals, pulses, fats, oils or sugars were all consumed as they were available without any refinement or processing. Later man discovered methods of cooking and also preserving food according to his need. By accident man discovered fire and then experimented and began to cook non-vegetarian foods like fish, meat etc. by direct roasting on fire. This was followed by salting food and dehydration of foods as preservation techniques.

The importance of food gave rise to a science called "food science". This is "a discipline in which the engineering, biological and physical sciences are used to study the nature of foods, the causes of deterioration, the principles underlying

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food processing, and the improvement of foods for the consuming public".

Food has been a basic part of our survival. Next to air and water, food is the utmost important thing for survival. Food is essential for growth, development, active and healthy life of an individual. Through, centuries, food has also been used, as an expression of love, friendship and social acceptance.

Food refers to anything, which nourishes the body. It would include solids, semisolids and liquids which when consumed help to sustain the body and keep it healthy. Food is a substance, which after ingestion, digestion and absorption is capable of being utilized by the body for its various functions.

3.2 FUNCTIONS OF FOOD

Food is classified according to their functions in the body as shown in Figure 1.

3.2.1 Physiological Functions of Food

The physiological functions of food can be further sub divided as follows

- a. Energy yielding foods
- b. Body building foods
- c. Protective and regulatory food.

a) Energy Yielding Foods

Food Sources: Cereals, millets, roots and tubers, sweets, jaggery, sugar, fats and oils.

Energy is mainly provided to our body through carbohydrates and fats in the food. Carbohydrates and fats provide energy to sustain involuntary processes in the body for continuous life, to carry out voluntary activities like professional, household and recreational activities and to convert food ingested into usable nutrients in the body. The energy needed is metabolized by oxidation of foods consumed.

b) Body building foods

Food Sources: Pulses, legumes, meat, fish, poultry, egg, milk and milk products.

In our body there is continuous breakdown of old tissues and building up of new tissues going on at all ages irrespective of the apparent growth thus maintaining a need for body building nutrients.



For the body building purpose, the major nutrients are proteins and minerals. Foods rich in protein are called body building foods. Milk, meat, egg and fish are rich in proteins of high quality due to the presence of essential amino acids. Pulses and nuts are good sources of protein but the protein is not of good quality because they lack some of the essential amino acids which are rich in cereals.

c) Regulatory and protective function of foods

Food Sources: Vegetables and fruits.

These foods regulate the activities of the body such as beating of the heart, maintenance of body temperature, muscle contraction, control of water balance, clotting of blood, removal of waste products from the body, etc.

Our body uses water in all its cells, organs and tissues to help regulate its temperature and maintain other bodily functions. Our body loses water through breathing, sweating and digestion, It is important to rehydrate our body by drinking fluids and eating foods that contain water.

Dietary fibers found mainly in fruits and vegetables, wholegrains and legumes provide health benefits such as relieving constipation, maintaining healthy weight lowering the risk of diabetes and heart diseases.

Apart from regulating our body processes, food also protects us from various infections, diseases and injuries. For example consumption of vitamin A & vitamin C rich food help in building resistance in the body to fight against invading organisms

3.2.2 Psychological Functions of Food

The second major function of food is psychological function. Food also satisfies certain psychological needs of human beings. Foods indirectly helps to provide a sense of security, love and acceptance.

Every one grows in a particular culture with its own unique food habits. The person begins to associate the food habits and foods commonly consumed as it gives a sense of security and satiety. Even a nutritionally balanced meal may not be satisfying to the individual, if food included is unfamiliar or distasteful.

3.2.3 Social Functions of Food

Food is also a symbol of social life. When a meal is shared with anyone else, the acceptance of friendship and respect for that person are expressed.

Earlier only persons enjoying equal status in society ate together. A person would never share a meal with someone inferior to him in social terms.

Food is a medium through which happiness is expressed. For example feasts are given at specific states of life such as birthday, marriage etc. Sweets are also distributed and exchanged to mark certain auspicious occasions like festivals. Such gatherings bring people together and help to strengthen mutual friendship.

3.3 BASIC FOUR FOOD GROUPS AND ITS SIGNIFICANCE

Food groups have been classified according to various methods from time to time. ICMR (2011) has classified the different foods items into four food groups as listed in Table 1. They are

- 1. Cereal, millets and pulses
- 2. Milk, and animal products
- 3. Fruits and vegetables
- 4. Fats, oils and nuts

Significance of the Four-Food Group System

The four food group system can be used for the following purposes:

- i. Planning wholesome balanced menus to achieve nutritional adequacy.
- ii. Assessing nutritional status a brief diet history of an individual can disclose inadequacies of food and nutrients from any of the four groups.

Based on the assessment, nutrition education can be imparted to the individual.

The quantity of the meals can be improved or is said to be optimum when the diets are complete. Every meal should have foods providing energy, protein, vitamins, minerals, fibre and adequate amount of water.

Table 1 Basic Four Food Groups						
	Food Groups	Main Nutrient				
1	Cereal Millets and Pulses: Rice, wheat, ragi, bajra, maize, rice flakes	Energy, protein, invisible fats, vit B1, B2, folic acid, iron, fibre				
	Pulses and legumes : bengal gram, black gram, green gram, red gram, rajmah	Energy, proteins, invisible fats, vit B1, B2, folic acid, calcium, iron fibre				
2	Milk and Animal products: milk, curd, skimmed milk, cheese, chicken, liver, fish, egg, meat	Protein, fat, vit B2, calcium				
3	Fruits and Vegetables : Mango, guava, tomato, papaya, orange, etc Green leafy vegetables: amaranth, spinach, coriander leaves, fenugreek leaves, drumstick leaves Other vegetables: carrot, brinjal, beans, Onions, etc	Carotenoids, vitamin C, vit B2, iron, folic acid, fibre Carotenoids, vitamin B2,folic acid, fibre Carotenoids, folic acid, calcium				
4	Oils, Fats and nuts Fats, butter, ghee, hydrogenated fat, cooking oil like groundnut, mustard, sunflower sugar, jaggery, sugar,Cane Almonds, walnuts, and gingelly seeds	Energy, fat, essential fatty acid Energy Protein, Omega 3 fatty acid				

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Balanced diet can be defined as one which contains different types of foods in such quantities and proportions that the need for all the nutrients are adequately met and a small extra provision is made for nutrients as a margin of safety.

REAL FOOD IS THE KEY TO HEALTH

What do we mean by real food?

Eating fruits, vegetables and whole grains that haven't been overly processed will keep you healthy. By eating whole food, you can avoid over-processed foods that are packed with sugar, sodium, carbohydrates and fats.

Millets

Millets are small – seeded grasses that are hard and grow well in dry zones as rainfed crops under marginal conditions of soil fertility and moisture. Millets are one of the oldest foods known to humans and possibly the first cereal grains to be used for domestic purposes. They are highly nutritious, gluten free. Hence they are soothing and easy to digest. They are considered to be the least allergic and most

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digestible grains available. Compared to rice, polished rice, millets release lesser percentage of glucose and over a longer period of time this lowers the risk of diabetes.



HEALTH BENEFITS OF MILLET

HELPS TO PROTECT HEART DISEASES LOWERS BAD CHOLESTEROL LEVELS BENEFICIAL IN DETOXIFYING BODY PPREVENTS TYPE 2 DIABETES PREVENTS ONSET OF BREAST CANCER EFFECTIVE IN REDUCING BLOOD PRESSURE

HELPS TO OPTIMIZE KIDNEY, LIVER AND

IMMUNE SYSTEM HEALTH



3.3.1 Types and Importance of Millets

Millets are particularly high in minerals like iron, magnesium, phosphorous and potassium, finger millet (ragi) is richest in calcium content.

Kinds of millets:

1.	Barnyard Millet	—	Kuthiravali
2.	Finger Millet	_	Ragi
3.	Foxtail Millet	-	Thinai
4.	Kodo Millet	_	Varagu
5.	Little Millet	_	Samai
6.	Pearl Millet	-	Kambu
7.	Proso Millet	_	Panivaragu

- 8. Sorghum Cholam
- Millets can be incorporated in our daily diet for almost all the meals and dishes. Breakfast items like porridge, dosa, idli, uppuma, puttu,ragi kali,doughnuts, vadas, bonda, chapathis, pooris etc are some of the commonly prepared items.

📝 Activity 1

List the Different kinds of millets available in the market

Activity 2

Formulate a recipe using millets

- Main meal items like ragi kali is highly nutritious.
- Millets can also lend themselves to the baking of cakes and biscuits as a 20% to 50% level of the cereal flour is being used and therefore enhance the nutritive value of the product. The nutritional content of millets is given in Table 2.

3.4 FOOD PYRAMID

Food pyramid is a visual tool that is used as a guide in designing diet. It is developed as a guide to provide a frame work for the types and amounts of food that can be eaten in combination to provide a healthy diet.

The Indian adaption of the food pyramid is divided into four levels

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Table 2 Nutritional Content in Millets							
Millet	Iron (in mg)	Calcium (in mg)	Minerals (in mg)	Fibre (in g)	Protein (in g)		
Pearl millet	16.9	38	2.3	1.3	10.6		
Finger millet	3.9	344	2.7	3.6	7.3		
Foxtail millet	2.8	31	3.3	8.0	12.3		
Proso millet	0.8	14	1.9	2.2	12.5		
Kodo millet	0.5	27	2.6	9	8.3		
Little millet	9.3	17	1.5	7.6	7.7		
Barnyard millet	15.2	11	4.4	10.1	11.2		

Source: Millet Network of India

of foods according to recommended consumption.

- 1. Cereals, legumes / beans, dairy products at the base should be eaten in sufficient quantity.
- 2. Vegetables and fruits on the second

level should be eaten liberally.

- 3. Animal source foods and oils on the third level to be eaten moderately
- 4. At the apex highly processed foods that are high in sugar and fat are to be eaten sparingly.



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One peculiarity of the Indian adaptation of the food pyramid is the recommendation to do regular physical activity. The pyramid provides information on the food types and amount necessary to meet daily dietary requirements. Each food group is represented by a band or level. Narrow bands at the apex indicate lower quantities, while wider bands at the base means that more from that food group needs to be consumed.

Most important is to include 2 to 3 litre of water each day as it's the most important nutrient constituting 70% of our body weight and helps to maintain our health.

It is very important that an individual incorporates the principles of good nutrition such as variety, a balanced intake of nutrients and moderation. The best way to meet the daily requirements is to eat a diet that combines cereals, fruits, vegetables, meat, fish, poultry legumes and dairy products. Eating a variety of foods daily as guided by the "Food Pyramid" will help to provide all the nutrients needed by the body.

3.5 METHODS OF COOKING

Cooking has been practiced since times immemorial. The ancient man ate only raw food.Once a piece of meat fell into the fire accidentally and got roasted. The ancient man ate this piece of roasted meat and liked it. Thus began the process of cooking. It has evolved a lot since then.

Cooking offers a wide variety of foods. For example food items like roti, puri, paratha, rice, pulao, pulses, vegetable, salad, chutney, pickle, curd, butter milk, fruits, etc.are prepared from different food. Boiled rice tastes different from jeera rice or pea pulao because these are cooked differently. Similarly, a chapatti tastes different from a puree or paratha, again because all these are cooked differently. Generally, vegetables like tomatoes, cucumber and fruits are best eaten raw while wheat, rice, pulses, potatoes and other vegetables must be cooked. Main objectives of cooking:

- Improves the taste and food quality.
- Cooking food to the required temperature for a required length of time can destroy all harmful microorganisms in food.
- Cooking improves digestibility.
- Cooking increases variety.

3.5.1 Moist Heat Methods

i) **Boiling:** Boiling is cooking foods by just immersing them in water at 100°C and maintaining the water at that temperature till the food is tender. It does not require special skill and equipment. It is time consuming.

Merits:

- 1. Simple method, does not require skill or any particular equipment.
- 2. Uniform cooking can be achieved.

Demerits:

- 1. Continuous boiling damages the structure and texture of food.
- 2. Vitamins B and C is lost if the cooking water is discarded.
- 3. It is time consuming and may lead to increased use of fuel.
- 4. Loss of colour —Water soluble pigments may be lost during cooking.

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Fig 3 Methods of cooking

Activity 3

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You must have eaten potatoes cooked in different ways. Can you name some?

ii) Simmering

When food is cooked in a pan with a well fitted lid at a temperature just below the boiling point 82°–99°C, it is known as

simmering. It is a useful method when foods have to be cooked for a long time to make it tender. (eg) vegetables.

Merits:

- 1. Food can be cooked with less chances of burning.
- 2. The flavour of the food can be enhanced.



3. Does not require any skill or specific equipment.

Demerits:

- 1. Takes a long time for cooking the food.
- 2. Precaution must be taken to ensure that the food does not get burnt.

iii) Poaching

This involves cooking in the minimum amount of liquid at a temperature of 80°–85°C. Foods generally poached are eggs and fish.

Merits:

- 1. No special equipment is needed.
- 2. It is a quick method of cooking and thus saves fuel.
- 3. Poached foods are easily digested as no fat is added.

Demerits:

- 1. Poached foods may not appeal to everybody as they are bland to taste.
- 2. Foods can get burnt if not monitored closely.
- 3. Water soluble nutrients may be lost if they are leached into the water.

iv) Stewing

This is a gentle method of cooking in a pan with a tight fitting lid, using small quantities of liquid to cover only half the food. The liquid is brought to a boiling point and then the heat applied is reduced to maintain the cooking at simmering temperature ie., 98°C. Apples can be cooked by this method.

Merits:

- 1. Loss of nutrients is avoided as the water used for cooking is not discarded.
- 2. Flavour is retained.

Demerits:

1. The process is time consuming and there is wastage of fuel.

v) Steaming

This method requires the food to be cooked in steam. This is generated from vigorously boiling water or liquid in a pan so that the food is completely surrounded by steam and not in contact with the water or liquid. Here the food gets cooked at 100 degrees.

Merits:

- 1. Less chances of burning.
- 2. Texture of food is better, as it is made light and fluffy.
- 3. Saves time and fuel.
- 4. Steamed foods like idli and idiappam have very negligible fat and are easy to digest, and are good for children, elderly and therapeutic diets.

Demerits:

- 1. Steaming equipment is required.
- 2. This method is limited to the preparation of selected foods.

vi) Pressure cooking

In pressure cooking escaping steam is trapped and kept under pressure so that the temperature of the boiling water and steam can be raised above 100°C thus reducing cooking time. Foods cooked in pressure cooker are rice, dhal, vegetables and meat.

Merits:

- 1. Cooking time is less compared to other methods.
- 2. Nutrient and flavour loss is minimized.
- 3. Conserves time, fuel and different items can be cooked at the same time.
- 4. Less chance of burning.
- 5. Constant monitoring is not necessary.

Demerits:

1. The initial investment cost may not be affordable by everybody.

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- 2. Knowledge of the use, care and maintenance of the cooker is required to prevent accidents.
- 3. Careful watch on the cooking time is necessary to prevent over cooking.

vii) Blanching

In meal preparation, it is often necessary only to peel off the skin of fruits and vegetables without making them tender. This can be achieved by the method of blanching. In this method food is dropped in boiling water for 5 seconds to 2 minutes depending on the texture of food. This helps to remove the skin without softening the food.

Blanching can also be done by pouring enough hot water on the food to immerse it for some time or subjecting foods to boiling temperatures for short periods and then immediately immersing them in cold water. This process causes the skin to become loose and then can be peeled off easily.

Merits:

1. Peels can easily be removed to improve digestibility.



- 2. Destroys enzymes that bring about spoilage.
- 3. Texture can be maintained, while improving the colour and flavor of the food.

Demerits:

1. Loss of nutrients if cooking water is discarded.

3.5.2 Dry Heat Methods

In this either air or fat is used as the medium of cooking.

3.5.2.1 Air as a Medium of Cooking

i) Grilling

Grilling consists of placing the food below or above or in between a red-hot surface. This results in the browning of the food.

Merits:

- 1. Quick method of cooking.
- 2. It improves the appearance, texture and flavour of the food.
- 3. Minimum oil is used.

Demerits:

- 1. Foods can be burnt due to carelessness.
- 2. Grilling denatures the proteins reducing their availability.

ii) Pan broiling or roasting

When food is cooked uncovered on heated metal or a frying pan, the method is known as pan-broiling, (e.g) chapathis.

Merits:

- 1. Quick method of cooking.
- 2. It improves the appearance, texture and flavor of the food.
- 3. Minimum oil is used.
- 4. Spices are easily powdered if they are first roasted.

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Demerits:

- 1. Foods can be burnt due to carelessness.
- 2. Grilling denatures the proteins.

iii) Baking

Here food gets cooked by hot air inside the oven. Foods baked are generally brown and crisp on the top and soft and porous in the centre, (eg) cakes and breads. The temperature that is normally maintained in the oven is between $120^{\circ}\text{C}-260^{\circ}\text{C}$.

Merits:

- 1. It gives a unique flavour to food.
- 2. Foods are made light and fluffy cakes, rolls, custard, bread.
- 3. Certain foods can be prepared only by this method bread, cakes.
- 4. Uniform and bulk cooking can be achieved.
- 5. Flavour and texture of the food is enhanced.
- 6. A variety of dishes can be made.

Demerits:

1. Special equipment like oven is required.

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- 2. Baking skills are necessary to obtain a product with ideal texture, Flavour and colour characteristics.
- 3. Careful monitoring needed to prevent scorching.

3.5.2.2 Fat as a Medium of Cooking

i) Sauteing

This method involves cooking in just enough of oil to cover the base of the pan. Foods cooked by sauteing are generally vegetables used as side dishes in a menu.

Merits:

- 1. Takes less time.
- 2. Simple technique.
- 3. Minimum oil is used.
- 4. Constant monitoring is needed to prevent scorching.

Demerits:

1. Constant monitoring is needed to prevent scorching.

ii) Shallow and deep fat frying

Here food is cooked on a tava with little oil (eg) chapathi, cutlets, etc. Deep fat frying food

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is totally immersed in hot oil and cooked. The temperature maintained is 180°–220°C (eg.) Samosa, Bajji, etc. The taste of the food is improved along with texture.

Merits:

- 1. Very quick method of cooking.
- 2. The calorific value of food is increased as fat is the medium of cooking.
- 3. It gives a delicious flavour and appearance to the food.
- 4. Taste and texture are improved.

Demerits:

- 1. Constant monitoring is needed to prevent scorching.
- 2. The food may become soggy due to too much fat absorption.
- 3. Fried foods are not easily digested.
- 4. Repeated use of heated oils will have ill effects on health.

3.5.3 Combination Method

i) Braising

Braising is a combined method of roasting and stewing in a pan with a tight fitting lid. Meat is cooked by this method.

Examples of foods cooked by braising are:

- 1. Uppuma: Roasting and
boiling2. Cutlet: Boiling and
- shallow frying. 3. Vermicelli payasam : Roasting and

simmering.

3.5.4 Innovative Methods

i) Microwave Cooking

Electromagnetic waves from a power source called magnetron are absorbed by the food and food becomes hot at once. Microwave cooking enhances the flavour of food because it cooks quickly with little



Fig 4 Microwave oven

or no water and thus preserves the natural colour of vegetables and fruits.

Merits:

- Quick method 10 times faster than the conventional method. So loss of nutrients can be minimized.
- 2. Only the food gets heated and the oven does not get heated.
- 3. Foods get heated uniformly.
- 4. Leftovers can be reheated without changing the flavor and texture of the product.
- 5. Microwave cooking enhances the flavor of the food because it cooks quickly with little or no water.

Demerits:

- 1. Baked products do not develop a brown surface.
- 2. Microwave cooking cannot be used for simmering, deep frying or stewing.
- 3. Flavour of all ingredients do not blend well as the cooking time is too short.

ii) Solar Cooking

Solar cooker works on solar energy. Solar cooker consists of well insulated box, the inside of which is painted dull black and

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Activity 4

Observe and list the changes in the colour, texture and taste of the following food items after they are cooked. Also note the method used for cooking them.

- Spinach
- Rice
- Toor dhal
- Potato
- Egg

▲ Fig 5 Solar cooker

is covered by one or more transparent covers, the purpose of which is to trap the heat inside the solar cooker. The temperature maintained is around 140°C. Cost of the cooker and the maintenance cost is low. It takes longer time and special vessels need to be used

Merits:

- 1. Simple techniques requires no special skill.
- 2. Cost effective as natural sunlight is the form of energy
- 3. Original flavour of food is retained
- 4. There is no danger of scorching or burning
- 5. Loss of nutrients is minimum as only little amount of water is used in cooking

Demerits:

- 1. Special equipment is needed
- 2. Slow cooking process
- Cannot be used in the absence of sunlight-rainy season, late evening and night

3.6 STEPS IN MINIMIZING LOSS OF NUTRIENTS DURING COOKING

Some nutrients are lost when foods are cooked. Nutrients like vitamin B and C are lost when foods are boiled or soaked in water and the water is thrown away. Nutrients like vitamin A are lost when fats are used for cooking foods. Therefore we must think of ways of saving these nutrients.

- Wash vegetables before cutting them so that minerals and vitamins are not destroyed. Do not wash the foods more than necessary.
- Peel vegetables thinly as vitamins and minerals are found just under the skin.
- Cut vegetables into large pieces just before cooking. Small pieces mean greater loss of nutrients.
- If vegetables are to be cooked in water, put them into boiling water. Scrape the peels very thin.
- Use just enough water for cooking. Do not throw away the extra water. Use this

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extra water to cook some other food.

- Do not use cooking soda. Use of tamarind or lemon juice helps to conserve the vitamins.
- Cook rice in just enough water which gets absorbed during cooking.
- Cook in a pan which has a well fitting lid. When you cook in an uncovered pan most nutrients are lost.
- Do not overcook the food as many nutrients will be destroyed.

Activity 5

You love to eat boiled rice and dhal. Rice has to be boiled with lots of water and the extra water is thrown away. You know that throwing this water means we throw away the soluble nutrients present in rice.

Why is it necessary to break this habit?

How can this problem be solved?

3.7 FORTIFICATION AND ENRICHMENT

Fortification is adding nutrients to the food even though the nutrient is already present in food. Fortification is done to improve the nutritive value whereas the process of improving the nutrient levels of nutrients which might be lost during processing in foods by special methods is called Enrichment.

Importance of Enhancing Nutritive Value of Food

• To meet the nutritional requirements of the body.

- To make proper selection and preparation of foods.
- To consume food in a balanced manner.
- To improve the flavour and texture of the food.
- To get variety in food.
- To assist in planning the daily menu, keeping in view the nutrient content of the food.
- To prevent deficiency diseases in the body.
- To develop good food habits.

Methods of Enrichment of Nutrients

There are three methods by which one can enhance or increase the nutrients present in food.

- i) Combination
- ii) Fermentation
- iii) Germination

i) Combination

Combination is the process of combining cheaper and commonly available foods from different food groups to improve the quality of nutrients.

Combining of foods from different food groups is the easiest way of eating all nutrients.



Combination of foods

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Combination of foods improves the quality of nutrients. Cereals lack certain essential amino acids and these are present in dhals. On the other hand dhals lack some other essential amino acids that are present in cereals. The quality of proteins becomes as good as that of milk. The combination of a variety of foods ensures better availability of nutrients.

Combination helps to

- i) Eat a diet that has good quality nutrients.
- ii) Use cheaper and easily available foods that enhance the nutrient content of food considerably.
- iii) Provide balanced diet to the family.

ii) Fermentation

Fermentation is a process in which some micro-organisms are added to the food. They change nutrients already present in the foods into simpler and better forms and also make other new nutrients.

Fermentation makes the dough rise and become almost double in quantity. During fermentation the microorganisms use up some of the nutrients present in the dough and change them into other better quality nutrients. They also make some new nutrients. Curd, bread, dhokla and idli are all examples of fermented foods.

Advantages of fermentation

- a) Fermentation improves the digestibility of foods. The microorganisms which cause fermentation break the proteins and carbohydrates into smaller parts, which are easier to digest.
- b) During fermentation of cereals and foods like peas, beans etc. the minerals, calcium, phosphorus, and iron are changed into better quality ones. These are then easily absorbed by the body.
- c) Fermented foods become spongy and soft and are liked by children and adults.

iii) Germination

Germination is a process in which small shoots come out of the dhal or cereal when these are kept with small amount of water. The grains and pulses to be sprouted need to be soaked in just enough water so that all of it is absorbed. If the extra water in which they are soaked is thrown away, a lot of nutrients are lost.

Grains like wheat, bajra, jowar, etc. can also be sprouted. These grains



can then be dried in shade and roasted lightly on a tawa. They can be ground and used in many dishes. Pulses are also sprouted first and then steamed and consumed. The time and water which each grain or pulse needs for soaking and sprouting is different. Normally 8–16 hours are needed for soaking and 12–24 hours for sprouting. The cloth in which the soaked dhal is tied should be kept moist all the time.

Germination helps

- i) Increase the digestibility of food
 - a) Some carbohydrates and proteins are broken down into smaller and easily digestible forms.
 - b) Grains and pulses become soft after sprouting, so they take less time for cooking and are easy for you to digest.
- ii) Increase the nutritive value of food with no additional cost

Some vitamins and minerals become more when foods are germinated Vitamin B becomes almost double in quantity while vitamin C increases almost 10 times.

3.8 KITCHEN EQUIPMENT

Knowing the names and uses of equipment is as important as knowing where to find them in a kitchen.

Minor Equipment: The small equipment that we use in the kitchen for food are known as minor equipment.

Measuring equipment

- dry measuring cups for solid ingredients
- measuring spoons for small amounts

- liquid measuring cup with space at top
- spatula to level off dry ingredients

Slicing and Cutting Tools

- paring knife cleans/pares fruits and vegetables
- utility knife for all cutting purposes
- butcher knife-heavy duty for large cuts of meat
- bread knife has serrated edge
- chef's knife/French knife for slice, dice, chop a triangle blade
- slicing knife has a long narrow blade used for meat and cabbage
- carving knife for meat
- peeler for peeling fruits and vegetables
- kitchen shears
- cutting board
- grater
- mixing tools
- baking tools
- cooking tools
- kitchen aids
- cookware
- cleaning equipment

The minor kitchen equipment is used mostly for prepreparation of foods.

Major Equipment: The major kitchen equipment that are used for everyday cooking would include a food processor (mixee cum grinder/blender), refrigerator, microwave oven and even a small non-commercial oven cum toaster and grill. ۲









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Oven Cum Toaster and Grill

These major equipment are very essential for daily use.

The refrigerator is used for storing food and keeping it fresh free from spoilage. These foods include vegetables, fruits, eggs, milk and milk products and leftover cooked food also. The freezer helps to store and preserve foods, especially raw food items like non-vegetarian foods such as fish, meat and chicken and their products at a much lower temperature (at zero degrees centigrade and below). ۲



3.9 BASIC RULES OF KITCHEN SAFETY

Cooking is fun, but kitchen safety is a priority. There are many types of equipment in the kitchen and environmental hazards that can be extremely dangerous. Sharp objects like knives, open fire by the oven, electrical appliances, and even bacteria around the kitchen.

Observing basic rules of kitchen safety is a good habit to develop. To prevent serious injuries or accidents: always pay attention to what you're doing, adopt a plan for kitchen cleanliness, and have necessary safety equipment at your disposal.

- Store knives in a wooden block or in a drawer
- Never cook with loose clothes on and keep long hair tied back.
- Never cook while wearing dangling jewellery
- Keep pot holders nearby and use them
- Turn pot handles away from the front of the stove.
- Don't let temperature-sensitive foods sit out in the kitchen.

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- Wipe up spills immediately.
- Separate raw meat and poultry from other items whenever you use or store them.
- Wash your hands before handling food and after handling meat or poultry.
- Get a fire extinguisher for the kitchen.

Follow these steps to keep cuts clean and prevent infections and scars.

- Wash your hands. First, wash up with soap and water so you don't get bacteria into the cut and cause an infection. If you're on the go, use hand sanitizer.
- **Stop the bleeding.** Put pressure on the cut with a gauze pad or clean cloth. Keep the pressure on for a few minutes.
- Clean the wound. Once you've stopped the bleeding, rinse the cut under cool running water or use a saline wound wash. Clean the area around the wound with soap and a wet washcloth. Don't get soap in the cut, because it can irritate the skin. And don't use hydrogen

FIRST AID BOX CONTENTS

First aid manual	Syringes
Band aid	Guaze (different
Scissors (small)	sizes)
Lotion	Thermometer
Roll Bandages	Contact lenses
Antiseptic wipes	Gloves

▲ Fig 6 Contents of a First Aid Box

DO YOU KNOW?

Alloxen, a byproduct of bleaching white flour which is often found in junk food, leads to diabetes by destroying pancreatic beta cells

peroxide or iodine, which could irritate the cut.

• **Remove any dirt or debris.** Use a pair of tweezers cleaned with alcohol to gently pick out any dirt, gravel, glass, or other material in the cut.

Generally a good antiseptic cream (silverex or burnol) should be kept handy. It is advisable to have a small first aid kit readily available in the kitchen.

SUMMARY

- 1. Having learnt about the functions of food, the different food groups and their nutrients, one would understand the importance of a balanced diet and would also be able to plan a balanced diet from the locally available foods.
- 2. Knowledge of the different methods of cooking along with their merits and demerits enables one to choose the best method of cooking for any given food, so as to ensure the availability of maximum nutrients.
- 3. A study on the different kitchen equipment and appliances helps in familiarizing the same. The chapter also throws light on simple first aid measures and different methods of improving the nutritional quality of common foods like cereals and legumes.

3 Food Science



ICT CORNER

Step 1:

Scan the QR code from your mobile and download 'Food Science' app. **Step 2:**

Select 'Fruits' tab and explore the list of fruits with its nutritional values. **Step 3:**

Select 'Vegetables' tab and explore the list of vegetables with its nutritional values.

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Step 4:

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Try to calculate and balance nutritional values of our daily needs with the food items.





ICT CORNER

Step: 1

Type URL or scan the QR code. 'Talking food pyramid' web page will open. **Step: 2**

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Click on the picture to start 'Talking food pyramid.

Step: 3

Place the mouse over the different parts of the food group to hear from the chef. At the same time healthy tips will appear in the text box.



Step1



Step2



Step3



http://www.nourishinteractive.com/kids/healthy-games /13-interactive-food-pyramid-five-food-groups





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GLOSSARY

- Existence (இருப்பு) Maintenance of life
- *Physiological* (உடலியல்) Relating to physiology
- **Regulatory** (ஒழுங்குமுறை) To control or direct
- Antioxidants
 (ஆக்ஸிஜனேற்ற)
 A

 substance that inhibits oxidation
 A

- Degenerative (சிதைவு) Progressive loss of function (of organs or tissue)
- Palatability (ஏற்புத்தன்மை) appetizing
- Marginal (சிறிய) small

Domestic - (உள்நாட்ரு) family/home/ private

QUESTIONS

- I. Choose the correct answer
- 1. _____ is the combination method of cooking
 - a. Braising
 - b. Boiling
 - c. Blanching
 - d. Sautéing
- 2. _____ is an example of minor equipment
 - a. Mixie
 - b. Grinder
 - c. Cooker
 - d. Knife
- 3. A method of cooking where food is cooked without coming in contact with water is called _____.
 - a. steaming
 - b. boiling
 - c. stewing
 - d. pressure cooking.
- 4. The moist heat method which preserves the maximum nutrients is called

- a. steaming
- b. boiling
- c. stewing
- d. pressure cooking

- 5. _____ is a poor source of iron.
 - a. green leafy vegetables
 - b. liver
 - c. milk
 - d. jaggery
- 6. The process of adding microorganisms to food is called
 - a. germination
 - b. fermentation.
 - c. fortification
 - d. additional cooking
- 7. The base of the food pyramid comprises of
 - a. Fruits
 - b. sugar
 - c. Meat
 - d. Cereals

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ll. Very short answer (2 marks)

- 1. Define the food guide pyramid?
- 2. What is "colour my plate"
- 3. List any 10 articles that should be present in the first aid box.
- 4. List the important nutrients present in millets
- 5. What is fortification? Give an example.
- 6. Which method of cooking is most effective in conserving nutrients in rice ?

III. Answer briefly (3 marks)

- 1. What are the functions of food?
- 2. Define germination and its benefits?
- 3. What are the merits of steaming foods?
- 4. List the basic four food groups?
- 5. Compare the merits and demerits of pressure cooking and microwave cooking.
- 6. What is the difference between germination and fermentation
- 7. List three minor equipments.
- 8. What are the do's and don't's to be carried out immediately in case of cuts and bruises.

REFERENCES

- Mudambi, S.R. and Rajagopal, M.V. (2008) "Food Science". New Age International (P) Limited Publishers, New Delhi.
- Manay, S. and Shadaksharaswamy, M. (1987) "Foods, Facts and Principles", New Age International Publishers, New Delhi
- 3. Roday, S. (2012) "Food Science and Nutrition" Tata McGraw-Hill publishing company limited, New Delhi.

9. Draw the food pyramid

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10. Suggest three ingredients in a health drink for school children

IV. Write in detail (5 marks)

- 1. Discuss the importance of the food pyramid.
- 2. What are the moist heat methods of cooking Explain in detail
- 3. Elaborate on the kitchen equipment used in day to day cooking
- 4. Rita suffers from protein energy deficiency. Suggest three recipes to enhance her health status
- 5. Is there a loss of nutrients during cooking? How can nutrient losses be prevented
- 6. Food is not only a source of nutrients explain.
- 7. In what way does the intake of 4 food groups serve as an important measure to prevent nutrient deficiencies ?

- Srilakshmi, B (2015) "Food Science". New Age International (P) Limited Publishers, New Delhi.
- Swaminathan, M. (1979) "Food Science and Experimental Foods". Ganesh & Co, Madras
- 6. www.humankinetics.com
- 7. Wikieducator.org> Different_m_c

3 Food Science

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