Unit 7

GPR2CD

RECENT CONCEPTS IN NUTRITION

Nutrition means to nourish and encompass the food people eat and how it enriches their lives physically, socially and personally. Food provides the nutrients that sustain life, but for most of us this is not the reason why we eat what we do. Researchers have found that various foods contain naturally occurring substances other than the nutrients that promote health. These foods are known as functional foods.

In this lesson, the students will be able to:

- understand the recent concepts in nutrition, such as Genetically Modified Foods, Nutraceuticals, Nutrigenetics and Nutrigenomics.
- acquire knowledge in the field of functional foods, prebiotics, probiotics and the importance of it in day to day life.
- give an idea on how to grow organic garden at home.
- acquire information on the medicinal and functional component of various fruits and vegetables

Recent concepts in nutrition

7.1 Food biotechnology

Genetically modified food is synthesized using biotechnological tools. Modern Biotechnology is also called as genetic engineering, genetic modification or transgenic technology. Food bio technology is defined as ***"Application of technology to modify genes of animals, plants and micro organisms to create new species which have desired production, marketing, or nutrition related properties".*** In this technology, Nuclear DNA is modified through insertion of gene of interest (gene encoding desired trait). This modified DNA is called as recombinant DNA. When r**ecombinant DNA** expresses, it encodes desired product. This technology, when implemented enhance food qualities or yield is called as food bio technology

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7.1.1 Recent Food Technology

Developments in food technology have contributed greatly to the food supply and have changed our world. Some of these developments are:

- **Pharma food :** food or nutrient that claims medical or health benefits.
- **Anti oxidants:** It is capable of stabilizing or deactivating free radical before they attack cells.
- **Chemoprevention:** It uses one or several compounds to prevent, strip or reverse the development of cancer.
- **Designer food :** Processed food that are supplemented with food ingredients naturally rich in disease preventing substances.
- **Functional food:** any modified food or food ingredient that may provide a health benefit beyond the nutrients it contains.

7.1.2 Genetically modified foods

Genetically modified organisms (GMOs) can be defined as "Organisms (i.e. plants, animals or microorganisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination". The technology is often called "modern biotechnology" or "gene technology", sometimes also called as *"recombinant DNA technology" or "genetic engineering"*. It allows selected individual genes to be transferred from one organism into another, also between nonrelated species. Foods produced from or using GM organisms are often referred to as GM foods.

7.2 Nutraceuticals

`The term Nutraceuticals is a hybrid or contraction of nutrition and pharmaceuticals. Nutraceuticals are products derived from food sources that are purported to provide additional health benefits, in addition to the basic nutritional value found in foods. It is classified into two:

1. Dietary supplements
2. Functional foods

DO YOU KNOW...?

The word Nutraceuticals was coined by Dr. Stephen L. Defelice founder and chairman of the foundation for Innovation in Mountain side.

ACTIVITY - 1

1. Nutraceuticals = _____ + _____.

2. Synbiotic = _____ + _____.

7.2.1 Dietary supplements

A product intended to supplement the diet that bears or contains one or more of the following dietary ingredients:

- a vitamin
- a mineral
- an herb or other botanical
- an amino acid
- a dietary substance used by man to supplement the diet by increasing the total dietary intake or
- a concentrate, metabolite, constituent, extract, or combination of any ingredient described above.

Dietary supplements are further defined as products that are labeled as dietary supplements and are not represented for use as a conventional food or as a sole item of a meal or the diet. Supplements can be marketed for ingestion in a variety of dosage forms including capsule, powder, softgel, gelcap, tablet, liquid, or indeed, any other form. Eg. Multi-vitamin capsules.

7.2.2 Functional foods

Functional foods are fortified or enriched during processing and then marketed as providing some benefit to consumers. Sometimes, additional complementary nutrients are added, such as Vitamin D to milk. Functional foods are "***Ordinary food that has components or ingredients added to give it a specific medical or physiological benefit, other than a purely nutritional effect.***" All functional foods must meet three established requirements: Foods should be

(1) present in their naturally occurring form, rather than a capsule, tablet, or powder

(2) consumed in the diet as often as daily and

(3) should regulate a biological process in hopes of preventing or controlling disease.

7.3 Classification of functional foods

Functional foods are classified in to

a. Probiotic b. Prebiotic

c. Synbiotic d. Phyto chemicals

7.3.1 Probiotic

Probiotic is a greek word which means "for life" It was coined by Lilly and Stilwell in1965. Probiotics are living microorganisms which upon ingestion in sufficient numbers, exert health benefits beyond basic nutrition. Probiotics are a viable microbial dietary supplement which uplifts the health of the host.

7.3.2 Prebiotic

In 1995, Prebiotics was defined by Gibson and Roberfroid as non-digested food components that, through the stimulation of growth and/or activity of a single type or a limited amount of microorganisms residing in the gastrointestinal tract, improve the health condition of a host. Prebiotics may be used as an alternative to probiotics or as an additional support for them. Prebiotics have enormous potential for modifying the gut

microbiota, but these modifications occur at the level of individual strains and species and are not easily predicted a prior.

7.3.3 Synbiotic

In 1995, Gibson and Roberfroid introduced the term "synbiotic" to describe a combination of synergistically acting probiotics and prebiotics. As the word "synbiotic" implies synergy, the term should be reserved for those products in which a prebiotic component selectively favours a probiotic microorganism. Synbiotics have both probiotic and prebiotic properties and were created in order to overcome some possible difficulties in the survival of probiotics in the gastrointestinal tract.

7.3.4 Phytochemicals

Phytochemicals are plant chemicals that differ from nutrients in some important ways. Phyto is a greek word for plants. Essential nutrient which include protein, fats, minerals, and vitamins are essential for life. Phytochemicals are not necessary for life but they help to promote optimal health by lowering risk for chronic diseases, such as cancer and heart disease. They are found only in plant foods. Fruits and vegetables are among the best sources of these compounds. Phytochemicals are believed to have many health benefits and prevent lifestyle diseases.. Some groups of phytochemicals have been linked to decreased cancer risk also. Following are examples of some phyto chemicals with nutritional importance.

7.3.4a Flavanoids

Flavanoids are a special class of phytochemicals that includes hundreds of different compounds. They are excellent antioxidants and some have hormonal properties. Among some of the most studied flavonoids are allicin, which is found in onions and garlic.

Benefits of Flavanoids

1. Longer life span
2. Prevents obesity and helps in weight management
3. Prevents cardio vascular disease, diabetes, cancer.
4. Prevents neuro generative disease
5. Slows down ageing process.

7.3.4b Carotenoids

Carotenoids are a group of phytochemicals that act as pigments, giving plants their bright green, orange, yellow, red, and blue colors.

Benefits of carotenoids

- Beta-carotene, found in carrots, sweet potatoes, green leafy vegetables, red peppers, and pumpkin. Beta-carotene from foods has been linked to a reduced risk for lung cancer.
- Lycopene, found in tomatoes and strongly linked to reduced risk for prostate cancer.
- Lutein, found in green leafy vegetables and linked to reduced risk for cancer and macular degeneration.

7.3.4c Antioxidants

Antioxidants are our first line of defense against free radical damage, and are critical for maintaining optimum health and wellbeing. Antioxidants are carotenoids, lycopene, vitamin C, vitamin A, vitamin E etc..

Benefits of Antioxidants

- Slower signs of aging, including of the skin, eyes, tissue, joints, heart and brain
- Healthier, more youthful, glowing skin
- Reduced cancer risk
- Detoxification support
- Longer life span
- Protection against heart disease and stroke
- Less risk for cognitive problems, such as dementia
- Reduced risk for vision loss or disorders like macular degeneration and cataracts
- Antioxidants are also added to food or household products to prevent oxidation and spoilage

7.4 Nutrigenetics

The study of **Nutrigenetics** concentrates on how even slight variations in our genetic code, affect our nutrient needs, susceptibility to particular diseases and response to our environment.

7.5 Nutrigenomics

Nutrigenomics is a branch of nutritional genomics and it is the study of the effects of foods and food constituents on gene expression.

7.6 Functional components of Fruits and vegetables

7.6.1 Red Fruits and Vegetables

The phytochemicals present in red coloured fruits and vegetables are **carotenoids and anthocyanins.** One of the most abundant carotenoids present in fruits is Lycopene, which helps reduce damage from free radicals in our body and it prevents heart diseases, cancer, prostrate problems and reduces the skin damage from the sun. Red fruits and vegetables are also often very high in vitamin C, which helps in cellular renewal in the body.

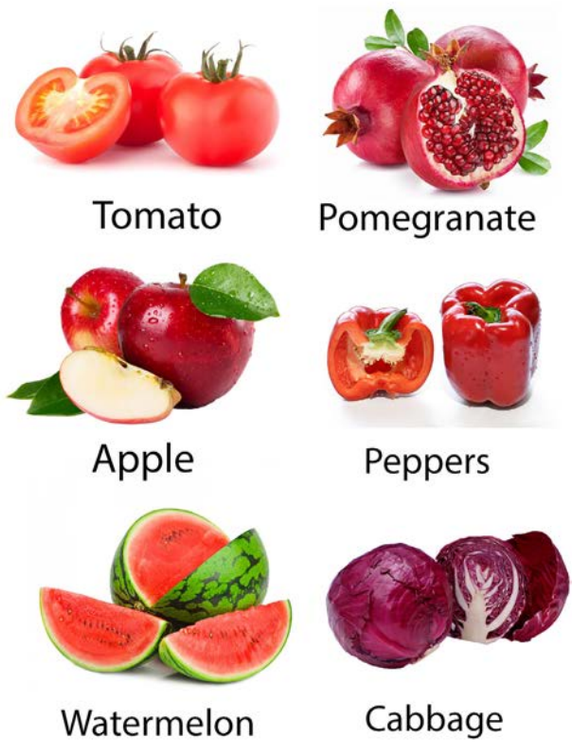


Fig 7.1: Red Fruits and Vegetables

7.6.2 Orange Fruits and Vegetables

Carotenoids are the powerful phytochemicals in orange coloured fruits and vegetables, and they give the fruits the bright color. Carotenoids repair DNA and help prevent cancer and heart disease, as well as strengthening our vision.

These orange foods also give the requited amount of potassium , vitamin A, B complex vitamin which keeps eyes and skin healthy and protects against infections.

They also boost the immune system because of the high content of vitamin C.

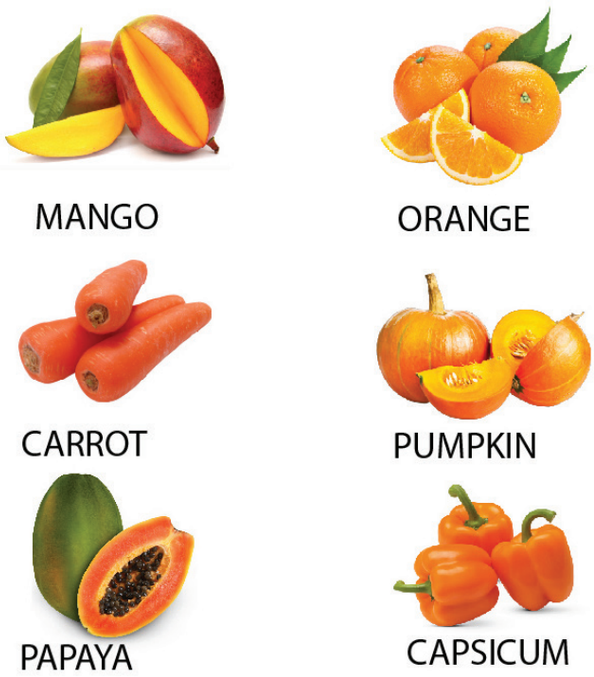


Fig 7.2: Orange Fruits and Vegetables

7.6.3 Yellow Fruits and Vegetables

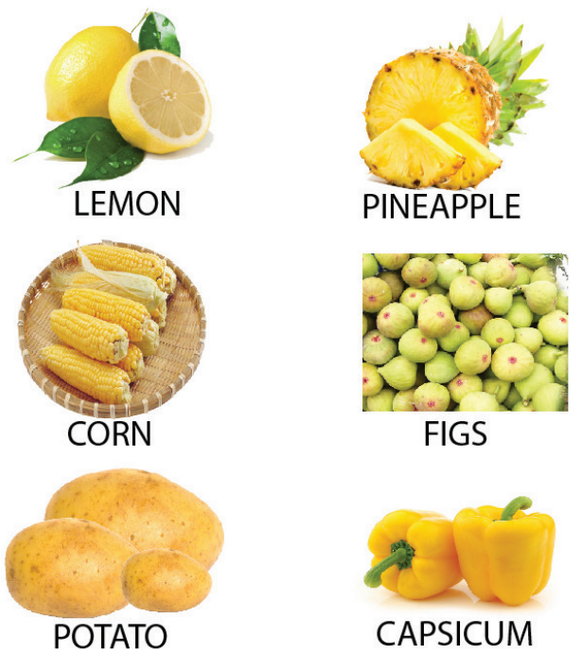


Fig 7.3: Yellow Fruits and Vegetables

Yellow foods are high in antioxidants like **vitamin C and phytosterols.** Vitamin C keeps our teeth and gums healthy, helps to heal cuts and wounds improves the mucus membranes (like when we have colds), helps to absorb iron, prevents inflammation, improves circulation, and therefore prevents heart disease.

7.6.4 Green Fruits and Vegetables

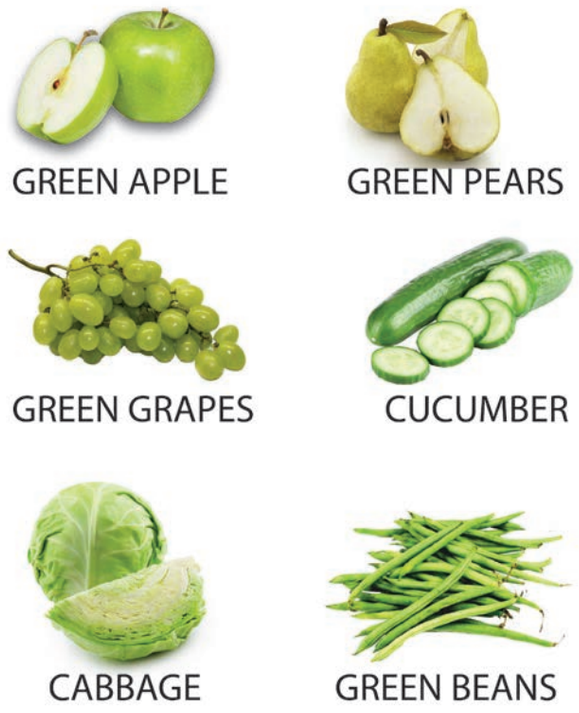


Fig 7.4: Green Fruits and Vegetables

These foods have the phytochemicals like **Terepenes, Sulforaphane and Indoles,** which both prevent cancer. They are also good for the circulatory system and are good sources vitamin B and minerals. Yellow green vegetables like figs, grapes, cucumber etc have carotenoids and lutein that help to prevent cataracts and eye disease, as well as osteoporosis.

7.6.5 Greenish/White Fruits and Vegetables

The strong phytochemical in these whitish/greenish vegetables is called **allicin** and **allium**, which give an anti-bacterial, anti-fungal, and anti-viral chemical environment in the body. It also contains **Theols,** the sulphur containing class of phytonutirents. All phytochemicals in the greenish/white list of fruits and vegetables helps maintain low cholesterol levels in the body preventing heart diseases.

Fig 7.5: Greenish/White Fruits and Vegetables

7.6.6 Blue/Indigo/Violet Fruits and Vegetables

The blue, indigo, and violet coloured fruits and vegetables are known for their anti-aging properties. These foods are loaded with of antioxidants, specifically **anthocyanins and phenolics** which prevents free radical damage. Some blue and purple fruits and vegetables are also high in vitamin C.

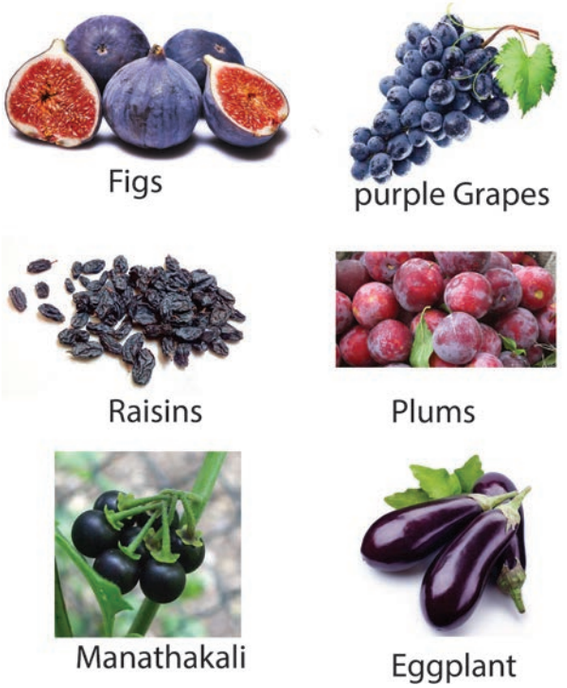


Fig 7.6: Blue/Indigo/Violet Fruits and Vegetables

They improve memory function and urinary tract health.

7.7 Organic foods

Organic foods are environment friendly foods which are cultivated using animal manure and compost as natural fertilizer. Organic foods are which in the purest form, grown without the application of chemical fertilizer or pesticides and sold to the consumers without adding preservatives and synthetic food enhancers. To further enrich soil crop rotation system is followed

7.7.1 Guidelines in Raising Organic Farms:

"Organic" technically refers to any material that is carbon-based. Organically raised food follows a set of prescribed practices that differ in a number of ways from industrialized agriculture. The farms must go through the certification process of the country or state which label their food organic. The process is expensive. Organic standards vary from country to country, and standards given below are followed in our country

- No use of synthetic chemicals
- No use of irradiation
- No use of sewage sludge (It gets used in other agriculture)
- No Genetically Modified Organisms (GMOs)
- Periodic on-site inspections

Fig 7.7: Organic foods

7.7.2 Tips to grow kitchen garden at home

1. Collect the pot materials,like sack made of jute or even synthetic sack or any reused tomato baskets, wooden baskets available from the market or unused buckets
2. Fill with good soil or compost materials (compost: you can prepare skin of vegetables, fruits and dump in a pit, spread in a layer alternatively with soil and along with earth worms for a longer period of time)
3. Purchase good variety of seeds of vegetables and fruits pertaining to the climate and season.
4. Plant it, keep it under the sun, water it regularly using water that has been used for washing vegetables, rice, dhal etc.
5. Remove the weeds regularly, don't over water it and maintain the plant by pruning the old leaves.
6. This will give you a good yield of vegetable and fruits grown from home
7. For example Brinjal, Ladies finger can be grown in all months, but tomatoes can be grown from the month April to August, and green leafy vegetables from the month of January to August

Fig 7.8: Tips to grow kitchen garden at home

ACTIVITY - 2

Match the following

1. Cranberry	-	Carotene
2. Orange	-	Allin
3. Lemon	-	Anthocyanin
4. Broccoli	-	Phenolics
5. Purple cabbage	-	Indole
6. Garlic	-	Lycopene

ACTIVITY - 3

Do you think you can grow organic foods at home? If Yes how is it possible?

Summary

- Genetically modified technology also called as modern biotechnology or gene technology recombinant technology or genetic engineering.
- Nutraceuticals is the word which combines nutrition and pharmaceuticals.
- Dietary supplement is a product taken by mouth that contains a dietary ingredient.
- The study of Nutrigenetics concentrates on how even slight variations in our genetic code, affect our nutrient needs, susceptibility to particular diseases and response to our environment.
- World soil day-December 5th
- The phytochemicals in red foods are carotenoids and anthocyanins.
- Yellow fruits and vegetables are high in antioxidants like vitamin C and phytosterols.

Glossary

Terms	Meaning
Functional foods	Functional foods deliver additional or enhanced benefits over and above their basic nutritional value
DNA	Deoxyribonucleic acid, a nucleic acid found in chromosomes
Organic	Pertaining or relating to a compound containing carbon as an essential constituent.
Metabolites	A substance that takes part in a metabolic reaction, either as reactant or product
Fortify	Enrich with nutrients to food
Complementary nutrients	Additional nutrients
Phytochemicals	Phyto chemicals are plant chemicals
Cataracts	It is a disease in which an area of someone's eye becomes less clear
Degeneration	A term applied in biology to certain changes undergone by plant and animal life.

Questions

Part-A Choose the correct answer(1 mark)

1. _____ means to nourish.

   a. food

   b. nutrition

   c. calorie

   d. healtth

GQ9TFN

2. Modern bio technology is also called as _____.

   a. genetic engineering

   b. genetic modification

   c. both

   d. genetic

3. _____ is the word combines nutrition and pharmaceuticals.

   a. nutraceuticals

   b. nutigenetics

   c. nutrigenomics

   d. organic

4. _____ is the study to know how genetic code affects our nutrient needs.

   a. organic genetics

   b. nutrigenetics

   c. pharmagenetics

   d. nutrigenomics

5. _____ foods are environment friendly foods.

   a. antioxidants

   b. organic

   c. flesh foods

   d. nutrigenetics

6. _____ are said to be plant chemicals.

   a. Phytochemicals

   b. genome

   c. nutracitives

   d. nutrigenetics

Part-B

Short answers (2 marks)

1. What are functional foods?
2. Define Nutraceuticals
3. Enlist the uses of functional foods
4. Define Nutrigenetics
5. Define Nutrigenomics
6. What are pre-biotic and probiotics?
7. What is Synbiotic?

Part-C

Brief answer (3 mark)

1. Explain the classification of Nutraceuticals
2. Differentiate probiotic and prebiotic
3. Mention the Phytochemicals present in Red fruits and vegetables and its functions
4. Enlist the uses of flavanoids
5. Write short note on Nutrigenetics and Nutrigenomics

Part-D

Answer in detailed (5 marks)

1. Explain the importance of functional foods

2 What are the phytochemicals present in different colour foods? Explain any two

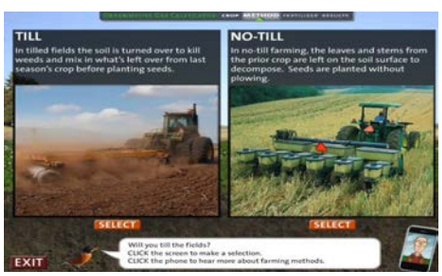
ICT CORNER

Farming

Through this activity you will learn to farm.

STEPS:

1. Use the URL to reach **'Interactive Farming'** page and click **'Start'** to play the game.
2. Select the crop you want to grow and observe how to plant them in the field.
3. Select the type of field you want to grow and till the land to observe the release of **'Green House Gas'** into the atmosphere.
4. Select the amount of fertilizer you want to utilize and get results of crop yield and greenhouse gas emission for your farming.



DOWNLOADING

Interactive Farming's URL:

http://forces.si.edu/soils/interactive/web/index.html

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