UNIT-2

Nutraceuticals

Neutraceutical can be defined as a food or a part of food or a nutrient which in addition to its nutrient values provide health benefits including prevention of disease.

Nutraceutical

Nutrition + pharmaceutical

The term was coined by Stephen De Felice in 1989.

Most of the diseases such as diabetes, cardiovascular, obesity, etc. occur due to incorrect diet and life style. Hence, neutraceuticals play an important role in disease prevention as well as promoting health.

Market Overview and Growth

→ The nutraceutical market is predicted to record a revenue of USD 671.30 billion in 2024.

→ developing countries have a higher number of non-communicable diseases like cancer, diabetes, cardiovascular ailments, therefore the demand for nutraceuticals is expected to rise in these nations.

→ Developed countries like United states and Europe have seen a fast emerging segment of customised products specially functional foods and beverages.

Scope

→ Nutraceuticals are expected to deliver promising outcomes in the prevention and occurrence of various diseases resulting due to improper lifestyle and food habits.

→ Various constituents of plants like catechins, carotenoids, lycopene, polyphenols, etc. have been very effective in the prevention of various diseases like cardiovascular, arthritis, cancer, GI disorders.

Types of nutraceuticals in market

1) Functional foods → cereals, bakery and confectionary, dairy, snacks, functional fats and oils, baby foods.
2) Functional beverages → energy drinks, sports drinks, fortified juices, dairy beverages, tea & coffee.
3) Dietary supplements → vitamins & minerals, botanicals, enzymes, fatty acids, proteins, prebiotics.

Probiotics and Prebiotics

Probiotics are foods or supplements that contain live microorganisms intended to maintain good bacteria (microflora) in body.
Prebiotics are foods that act as food for human microflora. Prebiotics are used with the intention of improving the balance of these microorganisms. Some prebiotic foods are yogurt, bananas, whole grains, onions, garlic, etc.

Role of nutraceuticals in various diseases

Disease	Nutraceuticals used
Diabetes	Polyunsaturated fatty acids
CVS diseases	Antioxidants, vitamins
Cancer	Vitamin C, D, E ascorbic acid
Bowel syndrome, GI disorders, constipation	Probiotics, Prebiotics

Herbs as Health Food

Alfafa

It is the entire plant of Medicago sativa belonging to the family Leguminoseae.

Chemical constituents

Alfafa contains protein, minerals, vitamins, phytochemical substances (carotene, chlorophyll, isoflavones, alkaloids), secondary metabolites of plants.

Uses.

Alfafa is used for kidney conditions, bladder and prostate conditions, increase urine flow.

It is also used in:

- high cholesterol
- asthma
- osteoarthritis and rheumatoid arthritis
- diabetes
- upset stomach

Garlic

It is the dried bulb of Allium sativum.
family: Liliaceae.

Chemical constituents

→ enzymes:- allinase, peroxidases, catalases, etc.
→ volatile oils :- allicin, allylpropyl disulfide.
→ Protein and amino acids.

Uses

It is used for:

(i) lower cholesterol and triglycerides
(ii) Kill worms and roundworms
(iii) hypertension
(iv) blood circulation

Ginseng

It is the dried root of Eleuthrococcus senticosus.
family: araliaceae

Chemical constituents

→ ginseng saponins and oils
→ phytosterol
→ carbohydrates and sugars
→ organic acids and nitrogenous substances
→ vitamins, minerals and certain enzymes.

Uses

It exhibits cardiovascular as well as mood and energy enhancing effects.

Spirulina

or blue-green algae

Spirulina is a cyanobacterium and primary sources are Arthrospira platensis and Arthrospira maxima.

Chemical constituents

→ 65% proteins and amino acids
→ 20% carbohydrates
→ 7% minerals
→ 5% fats
→ 3% moisture

Uses

It has:

(i) anti-cancer
(ii) anti-oxidant
(iii) Immunomodulation and
(iv) Anti-viral effects

Fenugreek

It is the dried seeds of Trigonella foenum.

family: leguminoceae

Chemical constituents

→ Alkaloids:- gentianine, trigonelline
→ Flavonoids:- flavone (apigenin, luteolin)
→ Proteins and amino acids containing high quantities of lysine and tryptophan

Uses

Fenugreek is used for:

(i) digestive problems such as loss of appetite, constipation and gastritis.
(ii) conditions that affect heart health
(iii) used in beri-beri, mouth ulcers, boils, bronchitis, tuberculosis
(iv) used in hernia, erectile dysfunction

Honey

Honey is a sweet secretion stored in the honey comb of Apis dorsata, Apis florea, Apis indica, Apis mellifica.

family: Apideae

Chemical constituents

- moisture 14-24%
- Dextrose 23-36%
- Levulose (Fructose) 30-47%
- Sucrose 0.4-6%
- Dextrin and gums 0-7%
- Ash 0.1-0.8%

Besides, it also contains small amounts of essential oil, beeswax, pollen grains, formic acid, acetic acid, succinic acid, dextrin, vitamins and mixture of enzymes, eg:, diastage, invertase.

Uses

1) sweetening agent
2) It relieves dryness, therefore used in coughs, colds, sore throats.
3) good source of nutrients for infants and elderly persons.

Chicory

Obtained from the plant Cichorium intybus.

family : Asteraceae

Chemical constituents

soluble fiber, phenolics, inulin, coumarin, tannins, monomeric flavonoids, beta-carotene, carbs., proteins, vitamins, minerals.

Uses

- coffee substitute
- used in high blood pressure, heart failure, loss of appetite, stomach upset, constipation.

Ashwagandha

It consists of dried roots and stem bases of the plant Withania somnifera,

family : Solanaceae

Chemical constituents

It contains alkaloids and steroidal lactones.

Uses

- sedative and hypnotic
- Hypotensive
- Respiratory stimulant
- Anti-stress and anti-arthritic

Ginger

It is the dried rhizomes Zingiber officinale.

family : Zingiberaceae

Chemical constituents

volatile oils, minerals, resins

Uses

- aromatic
- carminative
- flavouring agent
- adsorbent of toxins from GIT.

Amla

It consists of fruits of the plant Emblica officinalis and Phyllanthus emblica.

family : Euphorbiaceae

Chemical constituents

vitamin-C, calcium, iron and phosphorus

Uses

→ used as diuretic, laxative

→ used in the treatment of :

(i) Anaemia

(ii) Diarrhoea

(iii) Jaundice

→ Fruits are used to prepare shampoos & hair oils.

Herbal Drug & Herb-Food Interactions

Drug interaction is a reaction between two or more drugs or between a drug and a food beverage inside the body.
A drug interaction can make the drug less effective, increase activity or cause unwanted side effects.

Types of drug interactions

1) Drug-Drug interaction

These are the most common type of drug interactions. More the medications given, greater is the chance of drugs interacting with each other. One drug may increase the activity of another or inhibit its activity or serious unexpected side effects may occur.
Example- vicodin, a painkiller when taken along with sedating antihistamine drug produce an additive effect of drowsiness.

2) Drug-Food Interaction

Drug interact with food/beverages and can produce various side effects.
Example- grape juice reduces the enzyme activity in liver which are responsible for metabolising drugs thus increasing blood levels of certain drugs such cholesterol lowering drugs (statins), this leads to toxic effects of the drug such as muscle pain and muscle injury.

3) Drug-disease interaction

Sometimes drugs also interact with certain diseases where the disease alter the way a drug works.
Example- oral decongestants like pseudoephedrine, phenylephrine may increase the blood pressure, can be dangerous in patients having hypertension.

Mechanism of Drug Interactions

1) Pharmacodynamic
2) Pharmacokinetic
   - → Absorption
   - → Distribution
   - → Metabolism
   - → Excretion

1) Pharmacodynamic Interaction

This occurs when two or more drugs administered together act at the similar receptor sites leading to enhancement effects (addive or synergistic) or decreased effects (antagonistic).

2) Pharmacokinetic Interaction

This occurs when drugs interact during the proass of absorption, distribution, metabolism or excretion.

(a) absorption interactions

Some drugs can alter the absorption of another drugs. For example, calcium can bind with tetracycline and block its absorption, hence, such drugs should not be taken along with milk and antacids.

b) Distribution Interactions

One or more drugs can compete with each other for plasma protein binding sites resulting in displacement of one drug by the other. This increases its level in blood.

c) Metabolism Interactions

Enzymes in the liver such as cytochromes are responsible for metabolizing drugs and eliminating them from the body. Some drugs may alter the enzyme levels or its activity resulting in fast or slow metabolism of drugs.

d) Excretion Interactions

Some NSAIDs like indomethacin may lower the kidney function and reduce the excretion of lithium, a drug used for bipolar disorders.

Herbs & their interactions

1) Hypericum

It is a popular herb used to treat mild depression. The active constituent of this herb is 'hypericin', which has similar effects on brain as that of mono-amino oxidase (MAO) inhibitors. If taken together, they may cause rapid rise in blood pressure, severe headache, collapse and death. Foods such as cheese, fish, legumes, soya sauce and beer should be avoided with this drug.

2) Kava-Kava (Piper methysticum)

→ It is an herb that has anti-anxiety, pain relieving, muscle relaxing and anti-convulsant effects.

→ Kava should not be taken with drugs which act on nervous system such as barbiturates, anti-depressants, antipsychotics and alcohol.

→ Kava has also reported to produce hepatotoxic effects when taken with some drugs.

3) Ginkgo biloba

→ Ginkgo has been used to treat symptoms of Alzeimer's dementia, Parkinson's disease and to enhance the memory capabilities.

→ Ginkgo is reported to decrease the anti-viral effects of drugs used in HIV.

→ Ginkgo should be avoided in patients who are on anticonvulsants, blood thinners and anti-diabetic drugs.

4) Ginseng

→ Ginseng is used to improve the body's resistance to stress, boost the immune system.

→ Ginseng is reported to decrease the effectiveness of warfarin (blood thinner) and anti-hypertensive.

5) Garlic

→ lower blood sugar levels, reduce menstrual pain, lowering blood cholesterol levels

→ It affects blood clotting, hence should be avoided in patients taking blood thinning agents like aspirin and warfarin.

6) Pepper

→ contains piperine as the chemical constituent.

→ might increase the risk of bleeding when mixed with anticoagulants or blood thinning drugs.

→ might produce additive effect with anti-diabtic drugs and increase the risk of hypoglycaemia.

7) Ephedra

→ Ephedra is used to treat allergies, high fever and RT conditions.

→ Ephedra contains ephedrine which is a potent drug and stimulates heart, lungs and nervous system.