

Day - Saturday

1/5/21

UNIT - 2nd

Nutraceuticals

The term nutraceutical was given by Dr. Stephen De-Felice (USA) in 1989.

The term nutraceutical derived from 2 word nutrition and pharmaceutical.

Definition- According to De Felice, Nutraceutical can be defined as "A food or a part of food that provides medical or health benefits, including the prevention and or treatment of a disease."

According to health Canada nutraceutical means "A product prepared from foods but sold in the form of pills or powder or in other medicinal forms, not usually associated with foods and has a physiological benefit or provides protection against chronic disease."

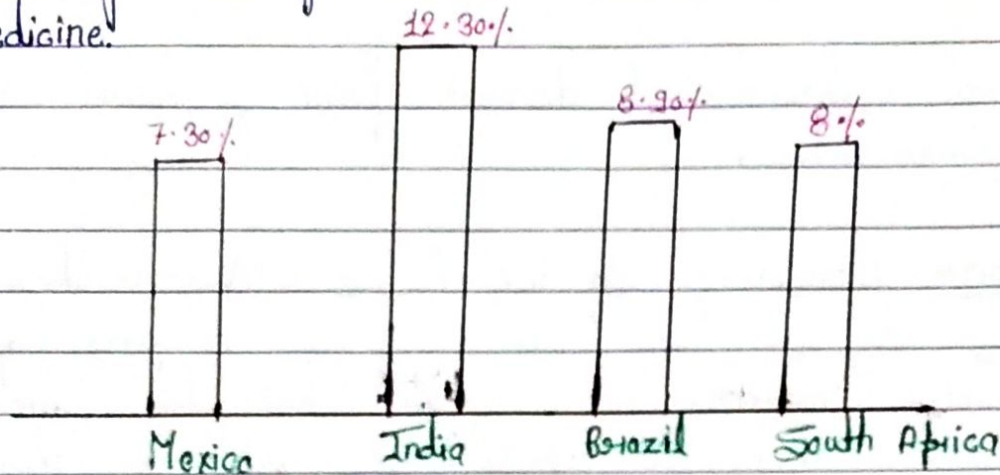
Global Market Growth of Nutraceutical

The prediction of growth of nutraceutical market is about USD (United State Dollars) 671.30 Billion by 2024.

Most of developing country use global importance of

nutraceuticals in disease like cancer, Diabetes and heart problem.

- Nutraceutical (N^+) cures many diseases due to improper life style, the gradually increasing health care expenses are also stimulating the demand for N^+ .
- Many developing country have an opportunity for economic growth by using their herbs and traditional medicine.



Source: Mordent Intelligence

Fig. Market growth rate of nutraceutical in developing countries

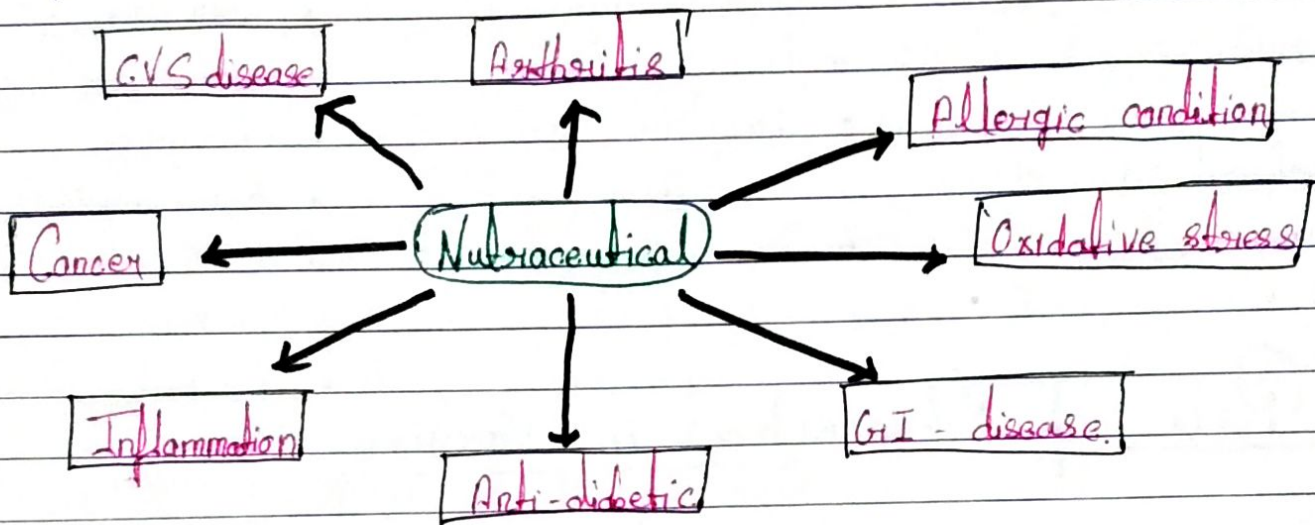
Global Companies Dominating the Nutraceutical Market

Top global companies -

- [1] Pepsico
- [2] Kellogg
- [3] Nestle
- [4] Nature of bounty inc.
- [5] Herbalife
- [6] Airway
- [7] Post holding inc.
- [8] Coca Cola
- [9] Clif box
- [10] Santosy
- Quest Nutrition
- [11] Aha Kcl Nutraceutical.

Scope of Nutraceutical

In the Era of N^t there is lot of scope of herbs food material and traditional medicine in the treatment of various disease and life style problem like-



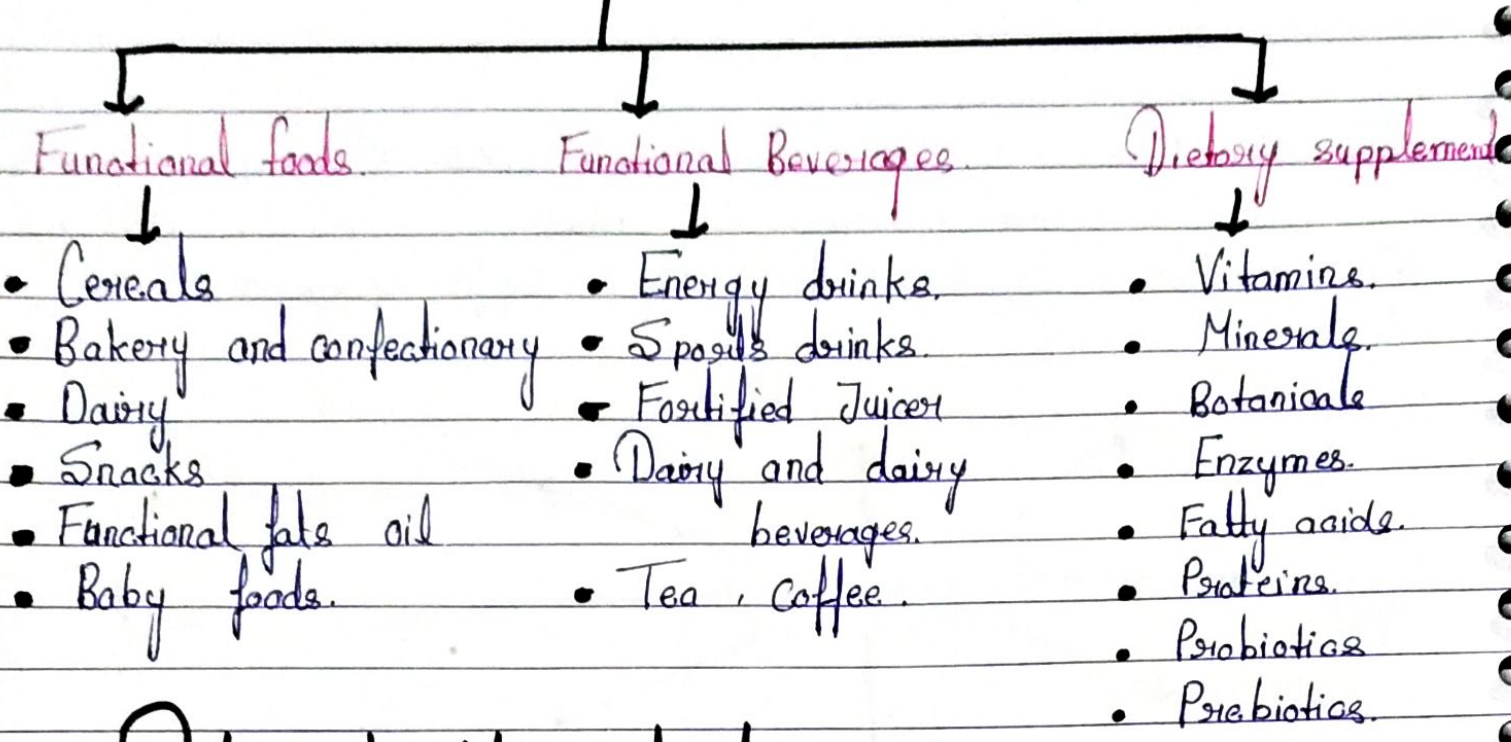
Nutraceuticals are expected to deliver promising outcomes in the prevention and occurrence of various disease resulting due to improper life style and food habits.

Various constituents of plant like catechins, carotenoids, lycopene, polyphenols, PVFA etc. have been very effective in the prevention and occurrence of various disease like cardiovascular, arthritis, cancer GI disorders.

Types of Nutraceutical Products available in the market

The N^t product is categorized into three products-

Nutraceuticals



Role of Nutraceutical in Various Disease

N⁺ play an imp. role in therapeutic areas such as arthritis, cancer, diabetes, digestion, cholesterol, BP, painkillers, depression, and various other disorders.

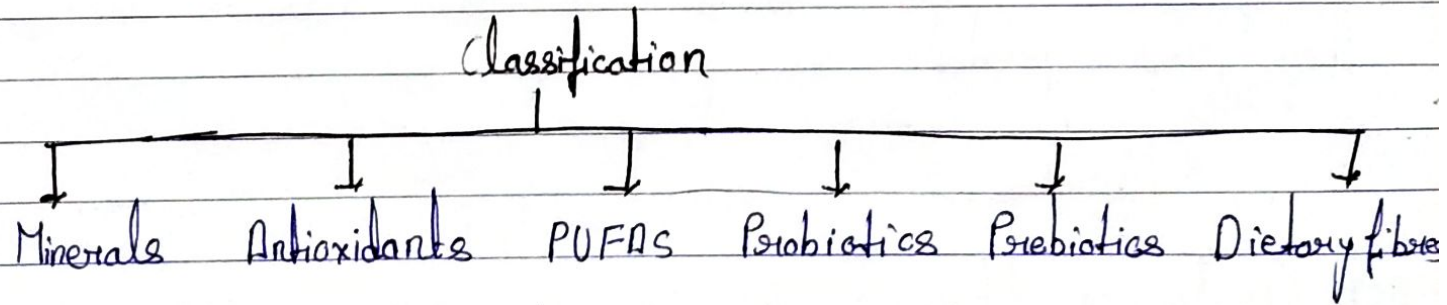
The following Table depicts the role of few plant and their constituents in the prevention and management of disease -

Plant / Constituents	Disease
[1] Antioxidant vitamins (Vit C, E carotenoids) Tocopherols, Ascorbic acid (fruit vegetables)	Cancer, Cardiovascular disease, cataracts, arthritis, Alzheimer's disease.
[2] Polyphenols (Tea, Coffee)	Diabetes, Anti-inflammatory, antimicrobial, Cardioprotective, Neurodegenerative disorder.

<p>[3] Curcumin (Turmeric) capsaicum (Capsaicum) Gingerol (Ginger) piperine (Pepper) eugenol (clove)</p>	<p>Digestive disorders, Antimutagenic Anti-inflammatory, lowers bad cholesterol Antioxidant, Diabetic Nephropathy</p>
<p>[4] Poly unsaturated fatty acid (PUFA)</p>	<p>Cardio vascular diseases, Anti- arrhythmic, hypolipemic, Anti-throm- botic, Asthma dysmenorrhoea, Diabetes.</p>
<p>Probiotics, Prebiotics</p>	<p>GIT disorders, Antitumor, constipation, Toxin Neutralization</p>

Classification of Nutraceutical

They can be classified according to their chemical nature and therapeutic properties as follows-



[1] Inorganic minerals Supplement-

Ex- Calcium, Magnesium, Manganese, Boron, Copper, Zinc, Phosphorus

[2] Antioxidant - They are present in fruits, vegetables and fishes.

They are used to prevent the reactive oxygen species and free scavenging radicals.

Ex- Vit. E, C, A Beta carotene.

53 Poly unsaturated fatty acids (PUFA)- These are fatty acids which contain more than one double bond and include essential fatty acids.

Ex- Omega-3 fatty acids, safflower oil, Corn oil, soyabean oil, fish oil.

54 Probiotics- These are living microorganism, which when taken with or without food improve intestinal microbial balance and functioning of large intestine.

Ex- Bifido bacterium, lacto bacilli, Saccharomyces cerevisiae etc.

55 Prebiotics- They are non digestible substances that provide beneficial effects and protection to the probiotics from gastric acid and digestive enzyme. They also promote the growth of probiotic bacteria.

Ex- Oligo fructose, Inulin, Galacto oligosaccharides, Lactulose.

56 Dietary fibres- They are two types viz- water soluble fibres and water insoluble fibres.

They are present in fruits, vegetable, grains, legumes etc.

They are used to correct constipation bowel irregularities haemorrhoids.

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Herbs as a Health Food

[11] Alfalfa

Source- It is the entire plant of medicago sativa belonging to the family Fabaceae.

Chemical Constituents- leaves, sprouts and seed contain Vit. K, Vit. C, copper, manganese, folic acid, thiamine, riboflavin, magnesium and iron.

One cup of sprouts contains 1 gm of protein and 1 gm of carbohydrates.

It also has a high content of bioactive compounds like saponins, coumarins, flavonoids, phytosterols, phytoestrogens and alkaloids.

Uses

- Hypo Cholesteremic
- Anti-hypertensive
- Diuretic
- Galactagogue
- Anti-arthritis
- To treat kidney stone.
- To relieve menopausal symptoms.
- Antioxidant

Note- Flavonoids are reported to possess antioxidant, anti-inflammatory and antimicrobial properties.

[2] Chicory

Source- It is obtained from the plant cicheto cichorium intybus, belonging to family Asteraceae.

Chemical Constituents- Chicory contains a variety of nutrients which include carbohydrates, proteins, vitamins, minerals, soluble fiber, phenolics, insulin, coumarins, tannins, monomeric flavonoids sesquiterpene lactones and beta carotene.

Uses- The roots are used as -

A coffee substitute and additive.

They are mixed in Indian filter coffee.

Used in high BP, heart failure, loss of appetite, stomach upset, constipation, cancer, liver and gall bladder disorders, inflammation and hepatic toxicity.

[3] Ginger

Source It is the dried rhizomes of Zingiber officinale belonging to the family Zingiberaceae.

C.C. It contains volatile oils, minerals, resins.

Ginger oil contains zingiberene, bisabolene, farnesene, sesquiphellandrene and camphene.

Resins contains phenolics ketones such as gingerols, shogaols, Zingerone and other compounds.

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Uses- Stomachic, Aromatic, Carminative, Stimulant, flavoring agent, in ginger beverages, adsorbent of toxins from GIT, To control Parasitic infections.

[47] Fenugreek

Source- It contains a seed of plant Trigonella foenum Graecum belonging to the family Leguminosae.

Synonyms- Medhika, Methi.

Active constituents- Fenugreekine, Trigonellin, Diosgenin.

Uses- Diabetes, Hyperlipidemia, Hypercholesterolemia, ulcer, upper respiratory tract infection, Arthritis.

[51] Garlic

Synonyms- Lasun

Biological source- Dried bulbs of Allium Sativum.

Family- Liliaceae.

Active constituents- Allicin, Allyl propyl disulphide, selenium, S-allylcysteine.

Uses- Hypertension, Diabetes, Hypercholesterolemia, Hyperlipidemia, Flatulence, Spasm.

[61] Honey

Synonyms- Madhu.

Biological source- Sugar secretion deposited in honey comb by bees Apis mellifera, Apis dorsata.

Family- Apidae.

Active constituents- Glucose, Fructose, Dextrin, Maltose, Formic acid, Acetic acid.

Uses- Nutritive and in cough.

[71] AMLA

Synonyms- Amalaki, Indian Gooseberry.

Biological source- Dried ripe fruit of Phyllanthus emblica.

Family- Euphorbiaceae.

Active constituents- Gallic acid, Ellagic acid, Vit C, amino acid, Phyllembin.

Uses-
Powerfull antioxidant.
Accelerates the cell regeneration.
Building the body immune system.

[87] GINSENG

Synonyms- Ninjin

Biological source- Dried root of Panax ginseng (Korea)
Panax quinquefolium.

Family- Araliaceae.

Active constituents- Oleanic acid, Panaxadiol, Panaxatriol, Dammarol

Uses- Stress, Fatigue, Erectile dysfunction, Hyperglycemia,
Aging, CVS, Menopausal symptoms.

[97] Ashwagandha

Synonyms- Withania.

Biological source- Dried roots of Withania Somnifera.

Family- Solanaceae.

Active constituents- Triacontane, Dihydroxystigmasterol, Withamine,
Somnine, Amino acid, Withanolides,
Withaferine A.

Uses- Sedative, Diuretics, Emetic, Dyspepsia,
Flatulence, Asthma, Nervic tonic,
Liver complains

[10] SPIRULINA

Biological source- Blue green algae, Spirulina Platensis and Spirulina maxima.

Family- Oscillatoriaceae.

Active constituents- Beta carotene, Proteinous nitrogen lipid, Vitamin B, fatty acid, Phycobiliprotein, glycogen, inositol.

Uses- Immunostimulatory, Hypolipidemic antiviral, Anti-inflammatory and anti-cancer effects.

Herb Drug and Herb Food Interaction

- The drug interaction is a reaction of drug molecule with food and another drug molecule which is present in G.I.T.
- So it is often risky to take nutritional supplement along with the other supplement and medicine.
- There are following guideline which minimize the herb drug and herb food interaction -

[11] Avoid taking mucilage containing herbs like isopogon, flax with other drugs as mucilage can inhibit the absorption of many drugs.

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[Q] Even mul mucilage containing drugs can alter the blood sugar level which have to be considered in case of diabetic patients.

[Q] Spicy substances such as ginger, Capsicum etc can enhance the absorption rate of some drugs, hence they need to be taken one hour after drug administration.

[Q] Heart tonic herbs such as digitalis/ Cactus / hawthorn should be avoided when taking heart medications.

[Q] Caffeine containing herbs like green tea, Kola, nut coffee and herbal stimulants like ephedra should be avoided when taking heart medication or mood altering drugs or antidepressants.

[Q] Avoid herbs or formulations containing liquorice when using diuretic like furosemide because liquorice can cause potassium depletion from the body.

[Q] While taking antidepressants like mono amino oxidase (MAO) inhibitors, avoid afro aphrodisiac herbs containing Yohimbine.

[Q] Green vegetable like brinjal, spinach, Cabbage etc which have high vit. K content are reported to interact with anticoagulant drugs as vit. K has coagulation promoting effects.

417 Grape fruit juice interact with calcium channel blockers (antihypertensive) lipid lowering drugs, psychiatric medication, oral contraceptive and antiallergic medication.
Grape juice modifies the metabolism pattern of these drugs in liver.

Study of Some Common herbs and their interaction -

[1] Hypericum Perforatum (St. John's Wort)

- This herb is very popular and used in the treatment of mild depression and the active constituent is (Hypericin).
- Hypericum is act as MAO inhibitor (antidepressant) drug causes very
- When this herb is taken with another food then it causes very serious drug interaction result in high blood pressure, acne, collapse and death.
- It interacted with food such as cheese, chicken, fish.

[2] Kava (Piper Methysticum) -

It is an herb that has anti-anxiety, pain relieving, muscle relaxing and anticonvulsant effect.

- Kava should not be taken with drug with act on nervous system such as barbiturates, antidepressants, antipsychotics and alcohol.
- It is reported that concomitant use of Kava with central nervous system depressant can increase the risk of drowsiness and motor reflex depression.
- Kava has also reported to produce hepatotoxic effects when taken with some drugs.

[3] Ginkgo biloba (Maiden Hair tree) -

- Ginkgo has been used to treat symptoms of alze alzheimer, s dementia, Parkinson's disease and to enhance the memory capabilities.
- Ginkgo is reported to decrease the antiviral effect of drugs used in HIV such as efavirenz or indinavir.
- Ginkgo can also alter the actions of drugs metabolized through liver such as omeprazole, fluvastatin and donepezil.
- Ginkgo should be avoided in patients who are on anticonvulsants, blood thinners and antidiabetic drugs.
- Ginkgo is reported to interact with over 250 drugs, hence patient should take proper consultation before using it.

41 Ginseng (Panax Ginseng) -

- Ginseng is used to improve the body's resistance to stress, boost the immune system and improve the sense of well being and stamina.
- It is also used to improve physical and mental performance and treat erectile dysfunction, hepatic symptoms related to menopause, lowering of blood glucose and controlling the pressure.
- Ginseng is reported to induce the activity of enzyme cytochrome P3A, in the liver which metabolises various drugs resulting in their decreased activity and faster excretion from the body.
- Ginseng decreased the effectiveness of warfarin (blood thinner) and increase the risk of clotting hence it should be avoided while taking anticoagulants.

Ginseng decreased the effectiveness of warfarin

- Ginseng is also reported to decrease the activity of anti-hypertensives resulting in high Blood pressure.
- It is also reported to affect the activity of antidiabetic drug, hence should be avoided in such cases.

[5] Garlic (Allium Sativum) -

- Garlic is used in various conditions like to lower blood sugar levels, reduce menstrual pain, lowering blood cholesterol and decreased blood pressure.
- Garlic doesn't interact with drugs at normal recommended doses, however exposure to concentrated garlic extracts for prolonged periods is reported to interact with several drugs.
- Garlic is reported to reduce the efficacy of drugs whose distribution is dependent on efflux \uparrow transporter mechanism.
- Garlic is reported to affect the blood clotting, hence should be avoided in patients taking blood thinning agents like aspirin and warfarin.
- Garlic alter the blood sugar level, hence used under supervision on patient with anti-diabetics.
- It is also reported that garlic supplements have decreased the blood levels of HIV protease inhibitors when used together.

Note- Grape juice decreases the activity of cytochrome P450 3A4 enzymes that are responsible for breaking down many drugs and toxins.

• Grape juice contain compounds known as Furanocoumarins that blocks the CYP 3A4 enzymes.

[6] Pepper [Piper Nigrum] -

- Black pepper contains piperine as the chief active constituents.
- It is used as spices as well as carminative and to treat arthritis, asthma and stomach upset and sinus infection.
- Piperine is reported to inhibit various cytochrome enzyme resulting in increased blood level of certain drugs like carbamazepine, midazolam, diclofenac, phenytoin and warfarin.
- Black pepper might increase the risk of bleeding when mixed with anticoagulants or blood thinning drugs like aspirin, clopidogrel, heparin and warfarin.
- Black pepper might increase the blood level of cefotaxime and cyclosporine resulting in increased drug effect as well as side effects.
- Black pepper might also increase the blood levels thereby enhancing the effects as well as side effects of anticancer drugs, antihypertensives, anti-convulsants and some antibiotics.

[7] Ephedra [Ephedra Gerardiana]

- Ephedra is used to treat allergies, high fever, and respiratory tract conditions like bronchospasm, asthma and bronchitis.
- Ephedra contains ephedrine which is a potent drug and stimulates heart, lungs and nervous system.
- Overdose or improper use of ephedra results in various effects like high blood pressure, heart attack, muscle disorders, seizures, stroke, loss of consciousness and death.
- Ephedra may reduce the effectiveness of antihypertensives and could raise the blood pressure.
- Ephedra should not be mixed with other central nervous system stimulants such as amphetamine and its derivatives as it may enhance hyperactivity and produce serious condition.
- Ephedra should be avoided with blood thinning medications such as aspirin and warfarin, as it may reduce bleeding.
- Ephedra may interact with anti-depressant like α -clomipramine, mirtazapine, linezolid and MAO inhibitors and enhance their effects.
- Ephedra should be avoided in people suffering from seizures as it may worsen the onset of seizures.