



RIZVI COLLEGE OF ARTS SCIENCE AND
COMERCE

INDUSTRY BASED PLANT PRODUCTS

S.Y.BSc – USBO303,UNIT III

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AROMATHERAPY

- Aromatherapy is the practice of using the natural oils extracted from flowers, bark, stems, leaves, roots or other parts of a plant to enhance psychological and physical well-being.
- The inhaled aroma from these "essential" oils is widely believed to stimulate brain function. Essential oils can also be absorbed through the skin, where they travel through the bloodstream and can promote whole-body healing.





CLASSIFICATION

- **Cosmetic Aromatherapy** – use essential oils on cosmetic products. Used as cleansing, moisturizing, drying and toning
- **Massage aromatherapy** – use of oils on skin for wonderful effects
- **Medical aromatherapy** – for treatments of medical ailments
- **Olfactory aromatherapy** –inhalation of essential oils for wellness, calmness, relaxation or rejuvenation
- **Psycho – aromatherapy** – inhalation for different states of emotional moods

APPLICATIONS

- **Massage** – Essential oil diluted with carrier oil and rubbed directly onto skin (Eucalyptus, Mimosa)
- **Inhalation**- most widely used. Essential oil added to boiling water and inhaled (Chamomile, Peppermint)
- **Baths** – few drops of essential oils in bath of warm water and soak in it (Jasmine, Lavender)
- **Hot poultices** – few drops of essential oils added to a bowl of hot water and cotton cloth is soaked in it to absorb oil. Placed over affected area till cooled (Rosemary, Lemongrass)



- **Cold compress** – like hot poultice but ice cold water is used (Citronella, Rose)
- **Pot pourri** – dried plants and plant parts spread with few essential oils. Kept in open bowl to fragrance room
- **Room Vaporizers** – water with essential oils is kept in bowl and warmed with candle for fragrance to spread in the room



JOJOBA – *Simmondsia chinensis*

Family -Simmondsiaceae

- **Properties** –golden yellow in colour, nutty aroma, stable, long shelf life, good carrier for essential oils
- **Chemical constituents** – contains palmitic, oleic, linoleic acids, Vitamin E,C and B complex, minerals like silicon, copper, zinc and high percentage of iodine
- **Application** – massage or bath oil



- **USES** – aromatherapy
 - Skin nourishment
 - Skin toner
 - Scalp care
 - Acne reduction
 - Lip care
 - Treatment for eczema
 - Treatment for sunburns



LEMON – *Citrus limon*

Family - Rutaceae

- **Properties** – pale greenish – yellow, refreshing taste and fresh, sharp aroma, has anti microbial, astringent and detoxifying properties, rich in vitamin C
- **Chemical composition** – pinene, camphene, limonene, flavonoid like hesperidin, vitamin A,B,C, calcium, potassium iron and copper
- **Applications** – commonly used as vaporizer or as bath oil, an important ingredient in aromatherapy products



► Health benefits and general uses –

- Calming, reducing fatigue, stress and anxiety
- High vitamin content helps in building immunity
- Treats various stomach disorders like indigestion and acidity
- Effective remedy for weight loss and insomnia
- Used in the food, confectionary and beverage industry
- Used in cosmetic products
- Effective insect repellent



JASMINE- *Jasminum grandiflorum*, *sambac, officinale* Family - Oleaceae

- **Properties** – rich, warm floral fragrance, has antidepressant, antispasmodic properties, is soothing, calming and revitalizing
- **Chemical composition** – Benzoic acid, benzyl acetate, eugenol and phytol
- **Applications** – can be inhaled, diffused or applied externally, can also be combined in oils, lotions, masks, creams, blends well with rose, sandalwood oil

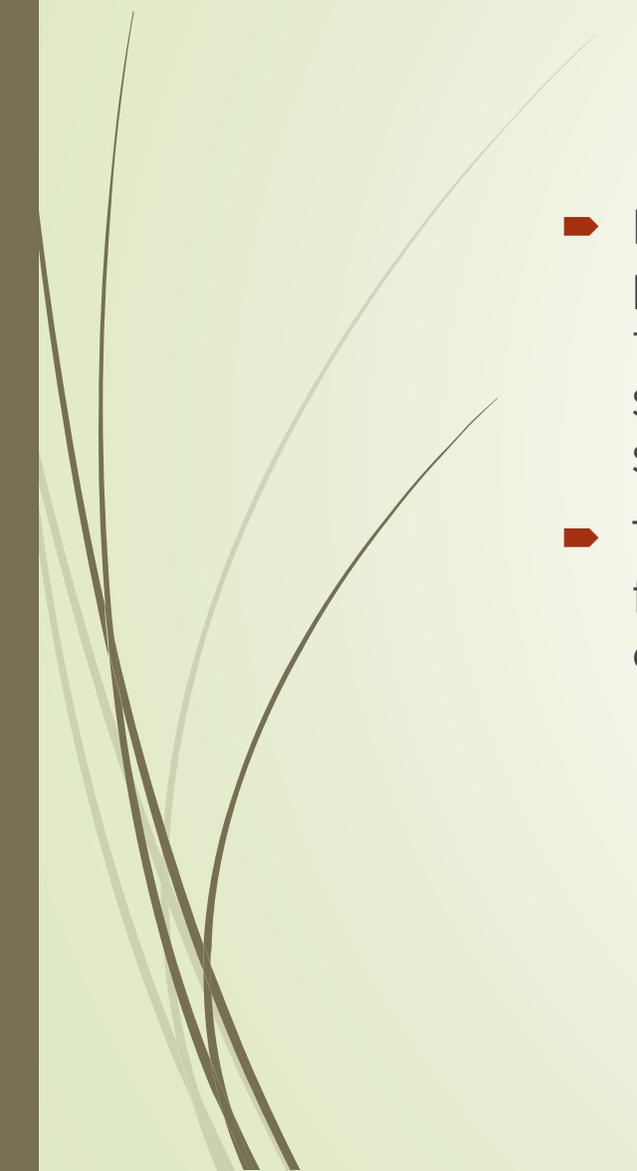


- ▶ **Uses** – Antidepressant and sedative stimulating release of certain hormones like serotonin to boost energy and uplift mood
 - ▶ Treatment of cough, cramps and congestion
 - ▶ Anti inflammatory agent for arthritis and rheumatism
 - ▶ On inhalation can act as an expectorant and to treat respiratory infections
 - ▶ Used to treat skin infections like dermatitis, eczema
 - ▶ Decreases physical and emotional problems of menopause
 - ▶ Good for uterine health



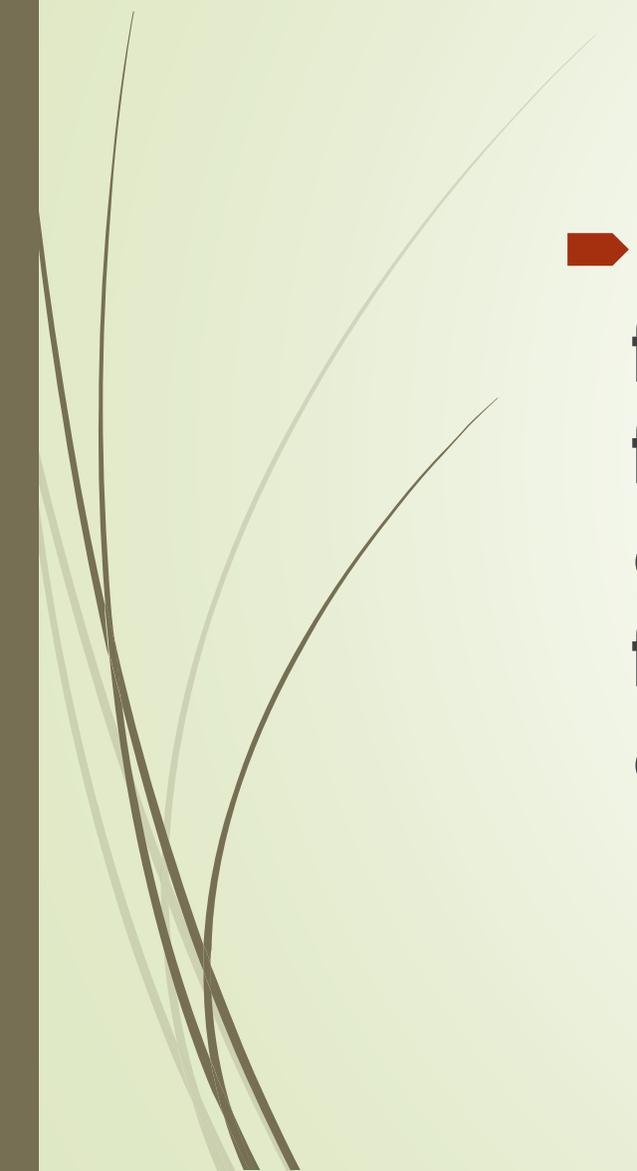


NUTRACEUTICALS

- ▶ Nutraceuticals is a broad umbrella term that is used to describe any product derived from food sources with extra health benefits in addition to the basic nutritional value found in foods. They can be considered non-specific biological therapies used to promote general well-being, control symptoms and prevent malignant processes.
 - ▶ The term “nutraceutical” combines two words – “nutrient” (a nourishing food component) and “pharmaceutical” (a medical drug). The name was coined in 1989 by Stephen DeFelice
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BOTANICALS



- A botanical is a plant or plant part valued for its medicinal or therapeutic properties, flavor, and/or scent. Herbs are a subset of botanicals. Products made from botanicals that are used to maintain or improve health may be called herbal products, botanical products, or phytomedicines**



Botanicals are medicines that are derived from plants. They have been used for centuries and are the foundation for nearly half of prescription drugs used today.





THE PHILOSOPHY

- ▶ **The philosophy behind nutraceuticals is to focus on prevention, according to the saying by a Greek physician Hippocrates (known as the father of medicine) who said “let food be your medicine”. Their role in human nutrition is one of the most important areas of investigation, with wide-ranging implications for consumers, health-care providers, regulators, food producers and distributors. The philosophy behind nutraceuticals is to focus on prevention, according to the saying by a Greek physician Hippocrates (known as the father of medicine) who said “let food be your medicine”. Their role in human nutrition is one of the most important areas of investigation, with wide-ranging implications for consumers, health-care providers, regulators, food producers and distributors.**

CATEGORIES

- **Categories of nutraceuticals**
- **The definition of nutraceuticals and related products generally depends on the source. They can be classified on the basis of their natural sources, pharmacological conditions, as well as chemical constitution of the products. Most often they are grouped in the following categories: dietary supplements, functional food, medicinal food, farmaceuticals.**
- **A dietary supplement represents a product that contains nutrients derived from food products, and is often concentrated in liquid, capsule, powder or pill form. Although dietary supplements are regulated by the FDA as foods, their regulation differs from drugs and other foods.**
- **According to their generally accepted definition, functional food is a category which includes whole foods and fortified, enriched or enhanced dietary components that may reduce the risk of chronic disease and provide a health-benefit beyond the traditional nutrients it contains.**
- **Medical food is formulated to be consumed or administered internally, under the supervision of a qualified physician. Its intended use is a specific dietary management of a disease or condition for which distinctive nutritional requirements are established by the medical evaluation (on the basis of recognized scientific principle).**
- **Farmaceuticals are medically valuable components produced from modified agricultural crops or animals. The term is a combining of the words “farm” and “pharmaceuticals”. Proponents of this concept are convinced that using crops (and possibly even animals) as pharmaceutical factories is much more cost effective than conventional methods, with higher revenue for agricultural producers.**



Potential health benefits

- ▶ Over the years nutraceuticals have attracted considerable interest due to their potential nutritional, safety and therapeutic effects. They could have a role in a plethora of biological processes, including antioxidant defenses, cell proliferation, gene expression, and safeguarding of mitochondrial integrity.
- ▶ Therefore nutraceuticals may be used to improve health, prevent chronic diseases, postpone the aging process (and in turn increase life expectancy), or just support functions and integrity of the body. They are considered to be healthy sources for prevention of life threatening diseases such as diabetes, renal and gastrointestinal disorders, as well as different infections.
- ▶ A wide range of nutraceuticals have been shown to impose crucial roles in immune status and susceptibility to certain disease states. They also exhibit diseases modifying indications related to oxidative stress including allergy, Alzheimer's disease, cardiovascular diseases, cancer, eye conditions, Parkinson's diseases and obesity

BOTANICALS AND NUTRACEUTICALS:

Spirulina

- ▶ *Arthrospira platensis* and *maxima* –commonly called spirulina
- ▶ Free floating, filamentous, blue green alga with multicellular trichomes in open left handed helix
- ▶ Available in tablet, flake and powder form
- ▶ Used as animal feed supplement in aquaculture, aquarium, poultry and animal husbandry



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- **Nutritional aspects - /100gm –**
 - **Protein – 60% protein, highly digestible , containing all essential amino acids**
 - **Fats – Rich in gamma linolenic acid, alpha linolenic acid**
 - **Vitamins – contains thiamine, riboflavin, nicotinamide, vitamin C,D,A and E**
 - **Minerals – K, Ca, Cr, Cu, Fe, Mg, Mn**
 - **Contains pigments like beta carotenes, xanthophylls, 24% carbohydrate and 5% water**

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- ▶ **Health benefits – dietary support in long term space flights**
 - ▶ Immunity booster and disease fighter
 - ▶ Cardiovascular benefits as it has antihypertensive effects
 - ▶ Antimicrobial and digestive as it stimulates production of beneficial microflora
 - ▶ Detoxifying agent as it eliminates accumulated toxins due to pollution and wrong lifestyle habits
 - ▶ Contributes to weight loss as its fat content is low
 - ▶ Anti cancer due to carotenoids and xanthophylls

Vanillin – from *Vanilla planifolia*

Family - Orchidaceae

- The plant is an epiphytic climber with thick succulent stem and aerial roots for support, flowers are pale yellow and fruits are long pendant pods with multiple seeds
- **Extraction – pods and seeds dipped in hot water**
 - Sun dried for 2 weeks
 - Wrapped in cloth and put in air tight containers to sweat
 - Due to this fermentation the pods shrivel and vanillin is freed
 - On storage the ripe pods get covered with crystals of vanillin
 - Can also be synthesized artificially from guaiacol or lignin



Vanilla Vine (*Vanilla planifolia*)

- **Properties – long, colourless crystalline needles, sublimates at high temp, soluble in organic solvents, sublimates at higher temperature**
- **Uses – commercially used in**
 - **Food and beverage industry as flavoring and tasting agent**
 - **In pharmaceuticals for Parkinsons, hypertension, cough and cold**
 - **Health care industry as an aromatic agent for various cosmetics, powders and soaps**
 - **Used as an aromatic stimulant in aromatherapy**
 - **Helps in food preservation**



Garcinia indica (kokum)

Family- Clusiaceae (Guttiferae)

- Ornamental , fast growing tree with dense canopy of green leaves and reddish pink small fruits
- **Nutritional aspect** – the fruit contains proteins, fats, carbohydrates, tannins, pectin, ascorbic acid, vitamin E, garcinol
- Available in powder or capsule form and as juice
- **Uses** – Culinary uses – to make sherbet and solkadi and outer covering of fruit is sundried and used as souring agent
- Industrial uses – used in confectionary, medicines and cosmetics



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- ▶ **Health benefits – weight loss – dietary fibres help as hunger suppressants**
 - ▶ Digestive agent – cooling agent so relieves acidity and cures gastritis
 - ▶ Immunity booster due to antibacterial and antiviral properties
 - ▶ Used as an anti allergic
 - ▶ Garcinol prevents oxidation of neurons and is being studied to treat Alzheimers
 - ▶ Used in anti ageing creams and to reduce wrinkles and scars due to its antioxidant properties

Chlorella pyrenoidosa, Division Chlorophyta, Class Chlorophyceae

One of the oldest living organisms

- Single celled fresh water green alga, no flagella, with a hard outer shell which has to be cracked for human consumption
- **Nutritional aspects** – contains carbohydrates, proteins, fats, vitamins A,B, C, E, iron, magnesium, zinc and fibres
- Consumed as powder or tablet or even liquid form

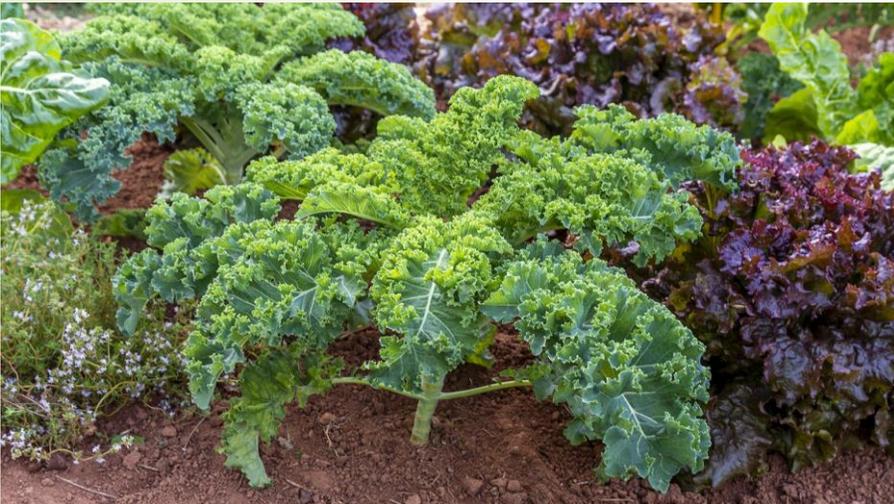


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- **Health benefits – Superfood-** due to presence of variety of nutrients
 - **Weight loss diet** – its complete nourishment reduces hunger
 - **Detoxification** – supports liver function and reduces heavy and unwanted metals
 - **Digestive agent** – improves gut health
 - **Antioxidative** – contains many antioxidants which reduce ageing fatigue and increases stamina
 - **Anti diabetic** – controls blood sugar levels, improves tolerance to glucose and reduces growth of fat cells

Kale – *Brassica oleracea* (var. *Oleracea*)

Family - Cruciferae

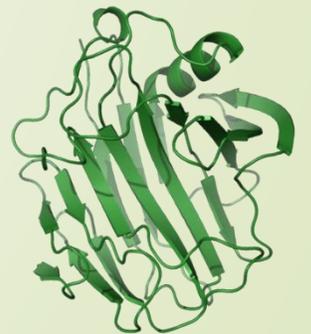
- ▶ Low calorie, zero fat, high fibre, nutrient rich leafy vegetable
- ▶ Can be green or purple in colour
- ▶ **Nutritional aspects** – contains carbohydrates, proteins, fibres, omega-3-fatty acids, vitamins A, B complex C, K, macro and micronutrients like magnesium, calcium, copper potassium



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- ▶ **Health benefits** – Nutritive food – high in nutrients and low in calories
 - ▶ Antioxidant agent – contains beta carotenes, vitamin C and flavonoids, hence protects the body from ageing, degeneration, Alzheimers, Parkinsons and reduces the chances of cataracts
 - ▶ Anti cancerous – contains high amount of indole -3 – carbinol
 - ▶ Anti –inflammatory – fights against arthritis, asthma and autoimmune diseases
 - ▶ Cardio protective agent – reduces total amount of cholesterol and bile acids
 - ▶ Good source of vitamins and minerals
 - ▶ Very good detoxifying agent

ENZYME INDUSTRY- CELLULASE

- ▶ Enzymes are biomolecules which are used in industries to speed up important reactions in order to get products rapidly and to maintain the reaction equilibrium
- ▶ **CELLULASE** – this enzyme catalyses the process of cellulolysis or the decomposition of cellulose and related polysaccharides
- ▶ **Source** – Fungi – *Aspergillus*, *Trichoderma*
 - ▶ Bacteria – *Clostridium*, Actinomycetes
 - ▶ Protozoans – Entodinium, Metadinium
- ▶ Cellulolysis involves the hydrolysis of 1,4 –beta-glycosidic linkages
- ▶ Types – Exocellulase, cellobiases, oxidative cellulases



- ▶ **INDUSTRIAL USES** – in processing of coffee, extraction of olive oil
 - ▶ In soap and detergent industry
 - ▶ In the paper and pulp industry for preparation of cardboard, soft paper
 - ▶ In textile wet processing
 - ▶ In fermentation of biomass into biofuels
 - ▶ In the wine and brewery industry to produce alcoholic beverages like beer and wine
 - ▶ Along with other enzymes used in agriculture for enhancing crop growth and controlling plant diseases

APPLICATIONS

- **Food & Dairy Industry** – Amylase, Protease, Rennin, Lipase, Lactase
- **Brewing Industry** – Amylase, glucanases, proteases
- **Paper Industry** – Amylases, Cellulases, ligninases
- **Biofuel Industry** – Cellulases, Ligninase
- **Textile Industry** - Cellulase, Lipase

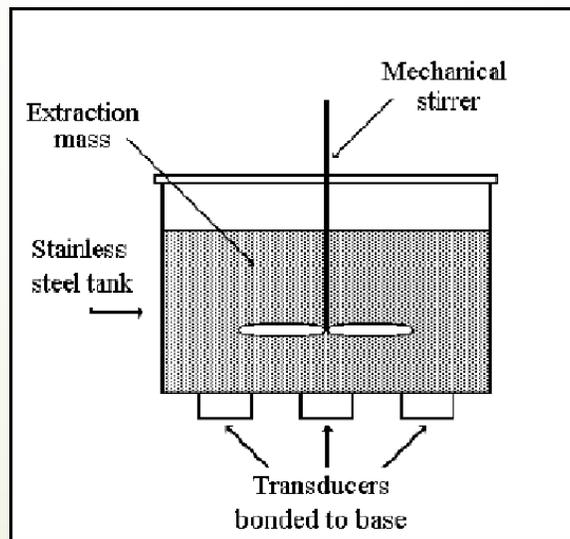


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- **Health benefits** – keeps blood sugar in control
 - Maintains cholesterol levels optimum
 - Acts as a detoxifying agent
 - Helps in carbohydrate metabolism

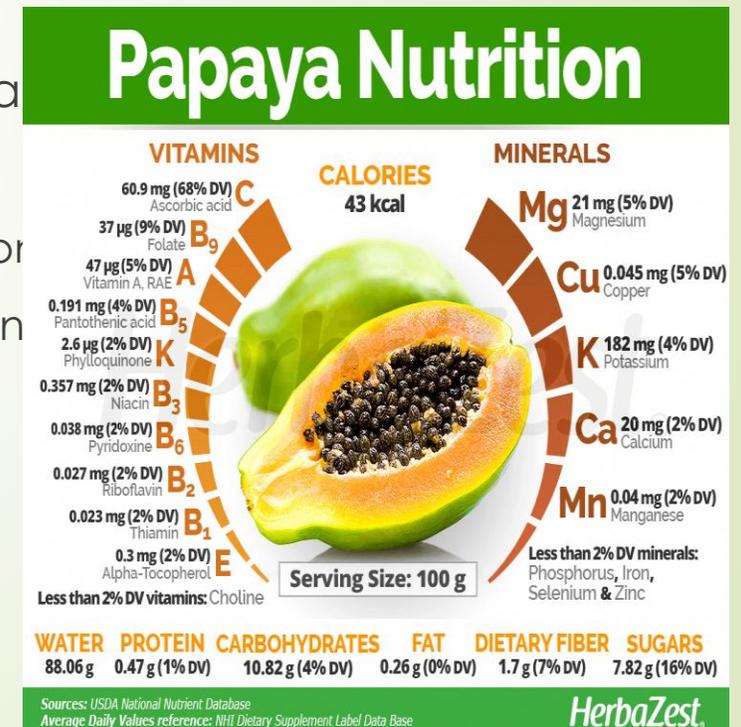


PAPAIN

- Also called papaya protease I
- Breaks own proteins into peptides and even amino acids
- **Source** – Roots, stems, leaves and fruits of *Carica papaya* plant
- Produced as crude dried powder by collecting latex, drying and extracting active papain



- **Industrial uses** – in tenderizing meat
 - In the production of cosmetics and contact lens cleaners
 - In stabilizing and chill proofing beer
 - Added to toothpastes as tooth whitener
- **Health benefits** – acts as an inflammatory a
 - Treating parasitic worms
 - For relieving pain, swelling, and fluid retention
 - Used as an antioxidant and for skin infection
 - As an immune supporter



BROMELAIN

- Natural plant derived protein digesting enzyme called cysteine proteases
- **Source** –found in members of Bromeliaceae family like *Ananas comosus* (pineapple) which contains stem and fruit bromelain
- **Properties** –available as a white powder, heat labile and soluble in water



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- ▶ **Industrial uses** – for tenderization of meat
 - ▶ In the brewing industry for clarifying beer
 - ▶ Added to gelatin to increase its solubility
 - ▶ Used in the leather industry for tanning
 - ▶ Important in soap, detergent and textile industry

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- ▶ **Health benefits** – as a supplement
 - ▶ As a muscle relaxant and healer
 - ▶ Acts as an efficient analgesic agent
 - ▶ Used in creams and ointments to treat rashes and burns
 - ▶ Prescribed with antibiotics for urinary infections
 - ▶ Used in treatment of autoimmune diseases

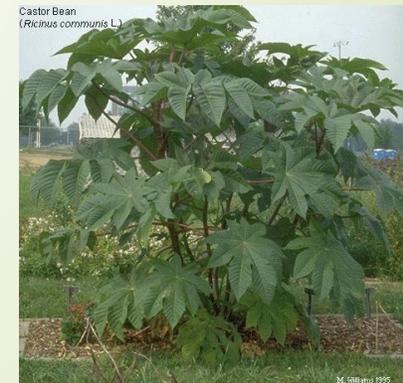
BIOFUELS

- Defined as solid, liquid or gas fuel obtained from any carbon source of biological origin which are commonly plants and plant derived products
- **Agrofuels** – biofuels produced from specific crops -
 - Crops high in sugar or starch are fermented to produce ethyl alcohol(sugarcane, corn)
 - Crops that contain high amounts of vegetable oil heated to reduce viscosity and then burnt to produce biofuel (oil palm, soybean, algae, Jatropha)

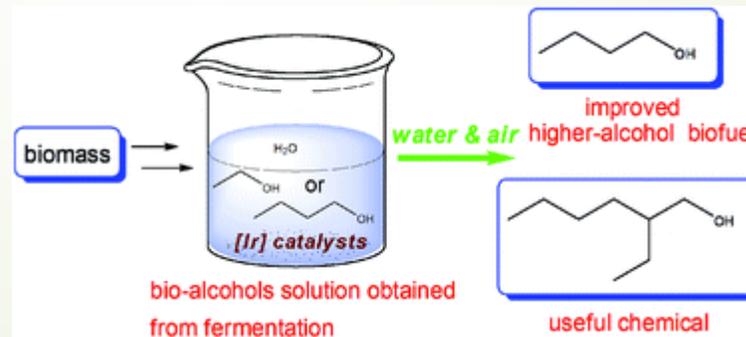
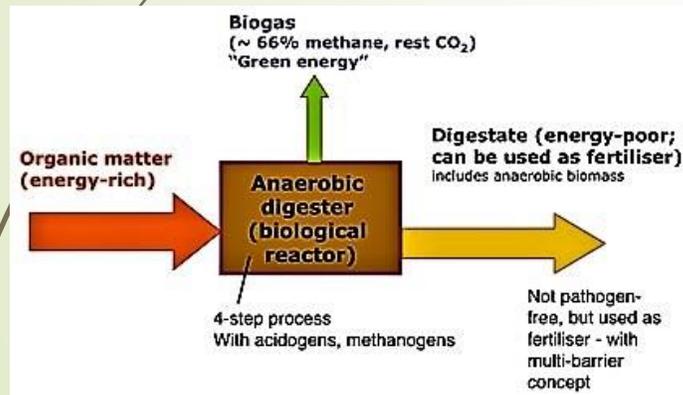


Types of biofuels

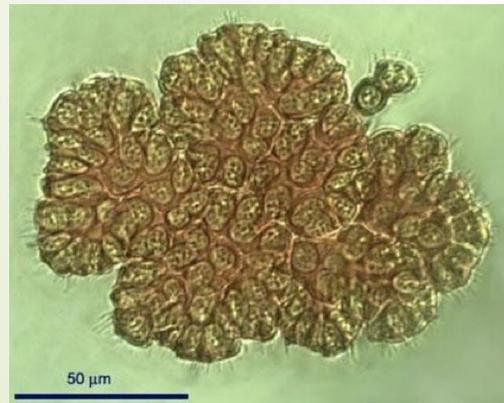
- **First generation biofuels** – produced from sugar, starch or vegetable oils using conventional technology
 - **Vegetable oil** – *Jatropha*, *Simmondsia*, *Azadirachta* – can be used directly after drying or after processing
 - **Latex** – *Euphorbia* – after water is removed from the hydrocarbon emulsions black oil is left. From the terpenoids gasoline is made and from sugars ethanol is made
 - **Biodiesel** – most common biofuel made of monoalkyl esters of long chain fatty acids, biodegradable, non toxic – from soy, flax, sunflower, groundnut, castor, hemp, algae



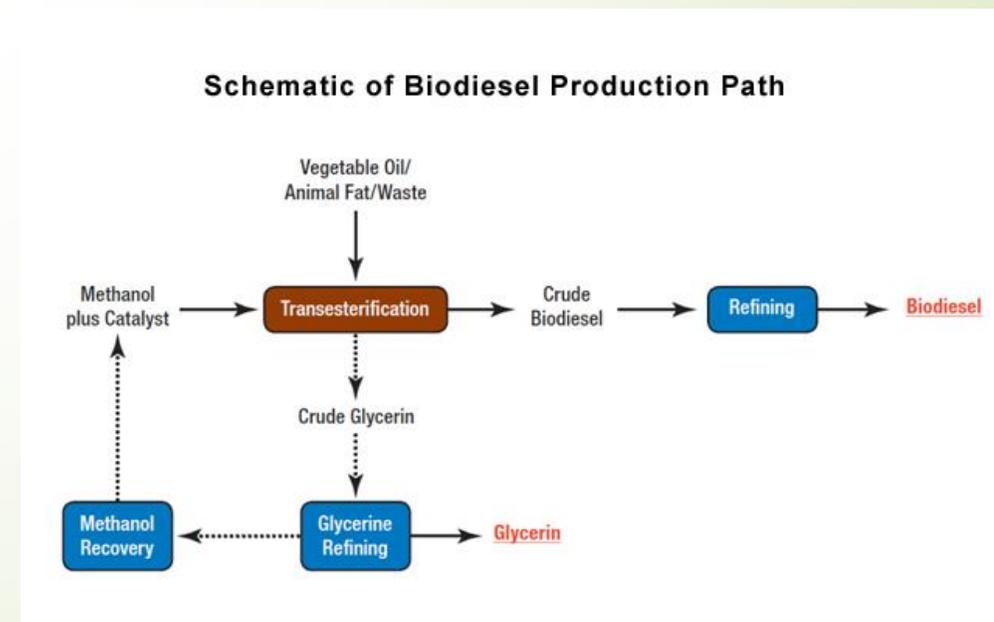
- **Bioalcohols** – bioethanol, biopropanol, biobutanol – by the microbial fermentation of sugar, starches or cellulose – can be used as petrol engines as a replacement for gasoline
- **Biogas** – produced by anaerobic microbial digestion of biodegradable waste materials – the solid by product can be used as a biofuel
- **Solid biofuels** – wood, sawdust, grass, non food energy crops, dried manure – can be burnt directly



- ▶ **Second generation biofuels** – residual parts such as waste biomass, corn stalks, leaf litter – lignocellulose from plants is used in production of cellulosic ethanol – myco diesel from a fungus *Gliocadium* is being worked on
- ▶ **Third generation biofuels** – also called algal biofuels – species of *Botryococcus*, *Chlorella* are generally used as source.
- ▶ The hydrocarbons are synthesized during growth phase
 - ▶ Alga is suspended in mineral oil in reactor, hydrogenation is carried out for an hour under high temperature and pressure, cobalt molybdate is used as catalyst



- ▶ **Advantages** – biodegradable so relatively harmless
 - ▶ Reduces dependency on fossil fuels
 - ▶ Renewable energy source
 - ▶ No net increase in atmospheric carbon
 - ▶ Contributes to waste management and fuel security





For the curious....

- ▶ <https://www.youtube.com/watch?v=OJw6WFkTPZo>
- ▶ <https://www.youtube.com/watch?v=zj6fDDQrl3w>
- ▶ https://www.youtube.com/watch?v=QP_HbQ5cWSk



Thank You
For Your Attention