Plant Metabolites (lecture 1)

Meaning of primary and secondary metabolites

A primary metabolite is a kind of metabolite that is directly involved in normal growth, development, and reproduction. It usually performs a physiological function in the organism (i.e. an intrinsic function). A primary metabolite is typically present in many organism or cell. It is also referred to as a central metabolite, which has an even more restricted meaning (present in any autonomously growing cell or organism).

Conversely, a secondary metabolite is not directly involved in those processes, but usually has an important ecological function (i.e. a relational function). A secondary metabolite is typically present in a taxonomically restricted set of organisms or cells (Plants, Fungi, Bacteria...).

Secondary metabolites are organic compounds that are not directly involved in the normal growth, development, or reproductionof an organism. Unlike primary metabolites, absence of secondary metabolites does not result in immediate death, but rather in long-term impairment of the organism's survivability, fecundity, or aesthetics, or perhaps in no significant change at all. Secondary metabolites are often restricted to a narrow set of species within a phylogenetic group. Secondary metabolites often play an important role in plant defense against herbivory and other interspecies defenses. Humans use secondary metabolites as medicines, flavorings, and recreational drugs.

Types of primary and secondary metabolites

Functions of primary and secondary metabolites in Plants

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Comparitive account of Primary and Secondary Metabolites (lecture 2)

The metabolism is defined as the sum of all the biochemical reactions carried out by an organism. Primary metabolic pathways converge too few end products while secondary metabolic pathways diverge to many products.

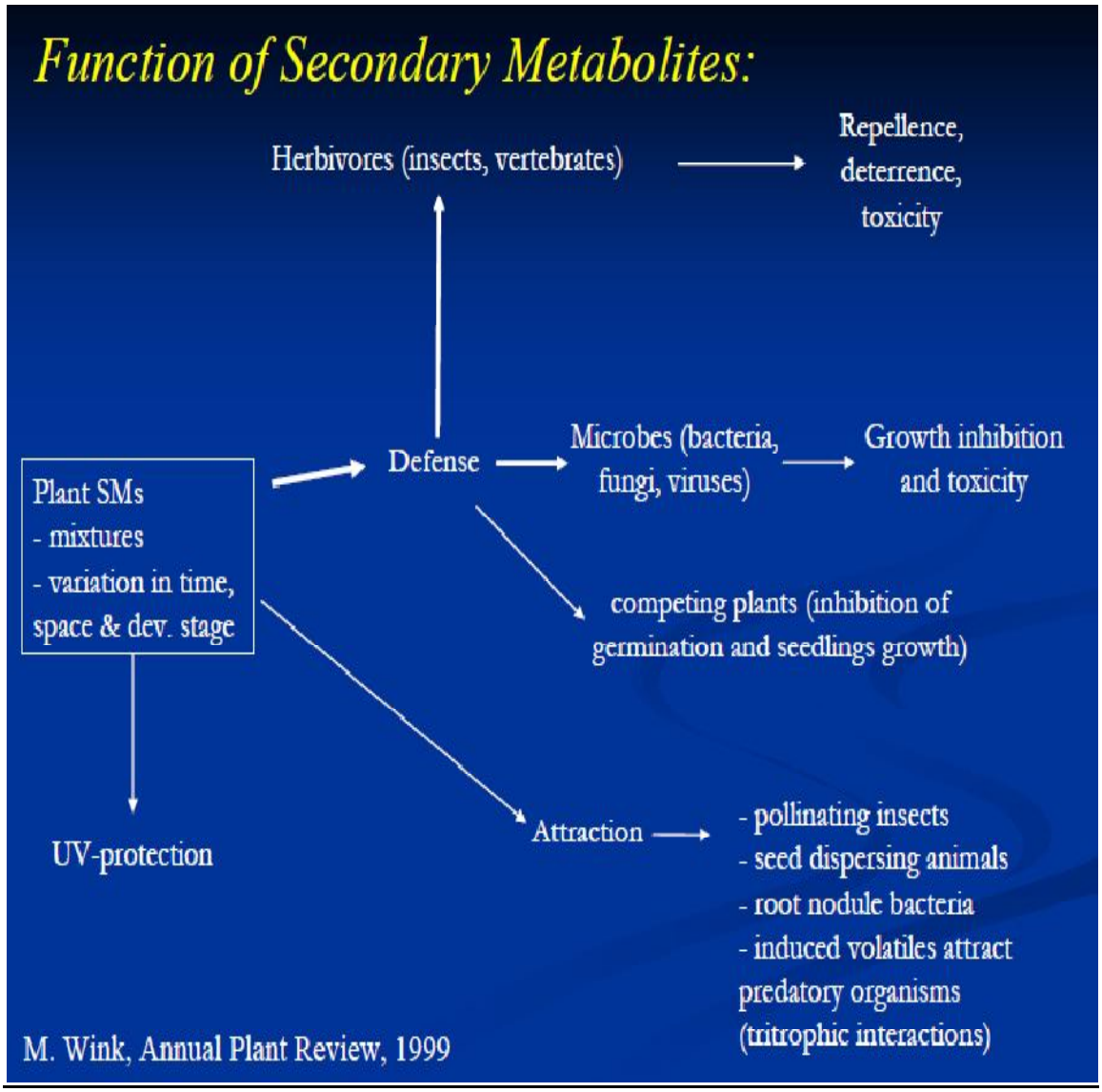
Primary requires the cell to use nutrients in its surroundings such as low molecular weight compounds for cellular activity. There are three potential pathways for primary metabolism: the Embden Meyerhof-Parnas Pathway (EMP), the Entner-Dourdorof pathway and the hexose monophosphate (HMP) pathway. The EMP pathway produces two molecules of pyruvate via triose phosphate intermediates. This pathway occurs most widely in animal, plant, fungal, yeast and bacterial cells. Many microorganisms however use this pathway solely for glucose utilization. During primary metabolism hexoses such as glucose are converted to single cell protein (SCP) by yeasts and fungi. This is generally done by using a combination of EMP and HMP pathways, followed by the TCA cycle and respiration. Yeasts from the Sachcharomyces species produce alcohol as cells grow during the log phase (during trophophase) using an anaerobic primary metabolic pathway. This accounts for most of the alcohol found in nature and is widely used in the fermentation industry to produce beer, wine and spirits.

Secondary metabolism synthesises new compounds. Secondary metabolites are not vital to the cells survival itself but are more so for that of the entire organism. Relatively few microbial types produce the majority of secondary metabolites. Secondary metabolites are produced when the cell is not operating under optimum conditions e.g. when primary nutrient source is depleted. Secondary metabolites are synthesized for a finite period by cells that are no longer undergoing balanced growth (22).

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications.

Role of Secondary metabolites in Plants (lecture 3)



References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Rationale (lecture 4)

This topic details the contribution to modern medicine and pharmacy made by natural products and drugs derived from natural products, with an emphasis on essential medicines and new introductions to the market. Areas covered include recent advances in the development of drugs derived from marine organisms, microbes, terrestrial animals, and vascular plants, and current issues regarding botanical medicines. The role of natural products in drug discovery and development is evaluated, particularly with regard to their value as sources of drug leads with "drug-like" properties. A rationale for the success of natural products research in providing new drugs and drug prototypes is presented, drawing on lines of evidence from chemical informatics and chemical ecology. Several innovative strategies for natural products drug discovery and evaluation of botanical medicines are also rwill be studied.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Historical contribution in the development of Phytochemistry (lecture 5)

Phytochemicals exist as long as plants exist but we only know about hundred years about their existence. Medicinal plants are traditionally used all over the world. It is likely that the knowledge of traditional medicine developed through trial and error over many centuries. The Chinese have the oldest medicine system. More than 5000 years ago, the Chinese based their medicine on the influence of yin and yang, and on the five elements. The earliest records about herbal medicine dates back to 2800 BC when the Chinese emperor Shen Nong wrote the text *The Great Native Herbal*. Hippocrates (460-377 BC) and Aristotle (384-322 BC) introduced the herbal medicine from India and Egypt to Europe.

The Greek physician Dioscorides wrote the book *De Materia Medica* in the first century AD.

During the 19th and 20th century, the main strategy of the scientists was to discover the active ingredients, which had medicinal or pesticidal properties. Examples of these discoveries are salicylic avid, morphine and pyrethroids (pesticides). During the 1980s many laboratories started to identify phytochemicals in plants that might be used as medicines. Many of these discovered phytochemicals seems to fight diseases such as cancer, heart attack and stroke. At the same time other scientist conducting epidemiological studies to determine the relationship between the consumption of certain phytochemicals and human health. Most studies showed that diets rich in plants give lower rates of cancer and heart disease.
Today, most new pharmaceuticals are not discovered in plants but are new synthetic creations. Recently there is a renewed interest in the discovery of phytochemicals. This renewed interest is our awareness has already developed many chemicals, which still have to be discovered. New modern laboratory techniques have made it easer to discover and identify new phytochemicals.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications.

Pharmacognostic Scheme for Study of Crude Drugs (lecture67)

Meaning-

Pharmacognosy is the study of medicines derived from natural sources. The American Society of Pharmacognosy defines pharmacognosy as "the study of the physical, chemical, biochemicaland biological properties of drugs, drug substances or potential drugs or drug substances of natural origin as well as the search for new drugsfrom natural sources."[1] It is also defined as the study of crude drugs.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications.

Pharmacognostic Scheme for Study of Crude Drugs (lecture 7)

Components-

A systemic study of a crude drug involves it's description on following lines:-

1. Official names
2. Biological source & family
3. Geographical source or habitat
4. History & introduction of crude
5. Cultivation , collection , processing for market & commerce in crude drugs
6. Morphological or macroscopical characters
7. Microscopic or histological studies
8. Chemical constituents & qualitative chemical tests
9. Pharmacological actions , therapeutic & other pharmaceutical uses & pharmaceutical preparations or formulations
10. Commercial varieties , substitutes & adulterants
11. Quality control of crude drugs & photo pharmaceuticals derived from them.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Significance of individual Pharmacognostic Parameter (Lecture 8)

The Latin name of the plant or animal with its family is called its botanical or zoological source respectively. Biological source of a crude also covers its nature ,limits for the active constituents & any relevant information affecting the quality of the crude drug during processing or storage .e,g The leaves of digitalis purpurea dried at a temperature below 60^0C , immediately after collection & the dried leaves should not contain more than 5% .

The geographical source of a crude drug givens us information regarding the origin of drug, place & the country where the crude drug is produced commercially on a large scale. e.g Indian senna is grown in & around India .

The history of a crude drug reveals information about its introduction to mankind i:e its original place of growth & its introduction into modern medicine . e.g history of some of the crude drug like Rauwalfia roots , cinchona bark & opium is very interesting .

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Significance of individual Pharmacognostic Parameter (Lecture 9)

The cultivation technology for a crude drug has to be studied systematically with reference to the selection of proper strains of seeds or germplasm , types of soil system , optimum climatic or ecological factors like light ,temperature ,rainfall& others factors like fertilizers , plant growth regulators etc .The crude drugs are collected from the plants when they are rich in their active constituent content. Drying of the plant material prior to packaging is necessary to minimize moisture content of a crude drug to protect it from microbial contamination or undesired chemical reaction during storage. The crude drugs can be dried either in sunlight or in shade or by use of artificial heat. In order to maintain high degree of quality in crude drug .(excessive moisture favours enzymatic activity & facilitate fungal growth) ,after during it is necessary to store & preserve it property .The macroscopical or morphological description of a crude drug includes size ,shape , nature of outer& inner surfaces ,type of fracture &organoleptic characteristics like colour ,odour , taste consistency ,etc .

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Significance of individual Pharmacognostic Parameter (Lecture 10)

Micoscopical study of an organized drug either in entire or powdered form , is one of the important aspects of its histological evoluation . The utility of crude drug is due to its therapeutically active constituent ,also contains several other constituent which are inert therapeutically e.g caraway contain fixed oil &protein , in addition to the active principle which is volatile oil , chemical tests are useful for the qualitative chemical evaluation of a crude drug .These tests are either general or specific &are usually performed for identification of the powdered drugs e.g senna give positive anthraquinone test.

The pharmacological action of active constituents of crude drugs & their therapeutically or pharmaceutical uses form an integral part of pharmacognostic scheme . Senna & cascara are used as purgatives , where as digitalis &straphanthus are cardiotonics. Rauwalfia is used in the treatment of high blood pressure &insanity the activity being mainly because of the reserpine alkaloid .Some flavouring &they are devoid of any significant pharmacological action e.g acacia &tragacanth are used as emulsifying agent , honey as a sweetening agent ,turmeric as a colouring agent &sandalwood oil for perfumes.

Adulterant resembles the genuine drug with respect to its morphological appearance &organoleptic characteristics ,However, it is devoid of active constituents which are present in the genuine drug .

The adulterants of s-nux vomica such as s-nux blanch &s-potatorum do not contain strychnine.

Evalution of crude drug means means its identification &determination of its purity &quality .Quality control of crude &its pharmaceuticals can be attempted by different methods evaluation depending upon the morphological &microscopical studies of the crude drugs or the physical, &their quality assurance form an integral part of drug –description.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Primary metabolites of Pharmaceutical and Industrial Utility (Lecture 11)

General Considerations and Definition

Many higher plants produce economically important organic compounds such as oils, resins, tannins, natural rubber, gums, waxes, dyes, flavors and fragrances, pharmaceuticals, and pesticides. However, most species of higher plants have never been described, much less surveyed for chemical or biologically active constituents, and new sources of commercially valuable materials remain to be discovered. Advances in biotechnology, particularly methods for culturing plant cells and tissues, should provide new means for the commercial processing of even rare plants and the chemicals they produce. These new technologies will extend and enhance the usefulness of plants as renewable resources of valuable chemicals. In the future, biologically active plant-derived chemicals can be expected to play an increasingly significant role in the commercial development of new products for regulating plant growth and for insect and weed control.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Classification (Lecture 12)

Primary metabolites are biological compounds necessary for the growth, development and reproduction of living organisms. They include carbohydrates, proteins, lipids and nucleic acids. Although discussions of primary metabolites typically focus on plant biology, all living organisms contain these compounds.

Carbohydrates-

Carbohydrates, or saccharides, are sugars of varying chemical complexity. Simple sugars comprise one sugar unit (monosaccharides), or two sugar units (disaccharides). Carbohydrates consisting of longer chains of monosaccharides are called polysaccharides; starches are the most familiar of these compounds.

Nucleic Acids-

DNA, or deoxyribonucleic acid, stores genetic information within the cell's nucleus. It consists of adenine, cytosine, guanine and thymine nucleotide bases arranged in a double helix. The two strands in this double helix are attached with a hydrogen bond. To replicate, the DNA breaks the hydrogen bond, so that each strand can separate and pair with a new strand. RNA, or ribonucleic acid, contains adenine, cytosine and uracil.

Lipids-

Lipids are a large group of organic molecules that includes fats, waxes, phospholipids and steroids. All lipids are hydrophobic, or insoluble in water. In discussions of primary metabolites, "lipids" normally refers to fats and steroids.

Proteins-

Proteins are macromolecule polymers comprising chains of amino acids; they are essential to all cellular functions. Protein synthesis has two stages: transcription and translation. In the transcription stage, genetic information in DNA is copied to messenger RNA (mRNA).

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Occurrence and Properties (Lecture 13)

Metabolites are compounds synthesized by plants for both essential functions, such as growth and development (primary metabolites), and specific functions, such as pollinator attraction or defense against herbivory (secondary metabolites). Metabolites are organic compoundssynthesized by organisms using enzyme-mediated chemical reactionscalled metabolic pathways. Primary metabolites have functions that are essential to growth and development and are therefore present in all plants. In contrast, secondary metabolites are variously distributed in the plant kingdom, and their functions are specific to the plants in which they are found.

Primary metabolites comprise many different types of organic compounds, including, but not limited to, carbohydrates, lipids, proteins, and nucleic acids. They are found universally in the plant kingdom because they are the components or products of fundamental metabolic pathways or cycles such as glycolysis, the Krebs cycle, and the Calvin cycle.

Because of the importance of these and other primary pathways in enabling a plant to synthesize, assimilate, and degrade organic compounds, primary metabolites are essential.

Examples of primary metabolites include energy rich fuel molecules, such as sucrose and starch, structural components such as cellulose, informational molecules such as DNA (deoxyribonucleic acid) and RNA (ribonucleic acid), and pigments, such as chlorophyll. In addition to having fundamental roles in plant growth and development, some primary metabolites are precursors (starting materials) for the synthesis of secondary metabolites.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Nomenclature (Lecture 14)

Carbohydrates

Carbohydrates, or saccharides, are sugars of varying chemical complexity. Simple sugars comprise one sugar unit (monosaccharides), or two sugar units (disaccharides). Carbohydrates consisting of longer chains of monosaccharides are called polysaccharides

Nucleic Acids

DNA, or deoxyribonucleic acid, stores genetic information within the cell's nucleus. It consists of adenine, cytosine, guanine and thymine nucleotide bases arranged in a double helix.

Lipids

Lipids are a large group of organic molecules that includes fats, waxes, phospholipids and steroids. All lipids are hydrophobic, or insoluble in water.

Proteins

Proteins are macromolecule polymers comprising chains of amino acids; they are essential to all cellular functions

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

General Biogenesis (Lecture 15)

Primary metabolism comprises the chemical processes that every plant must carry out every day in order to survive and reproduce its line.

Photosynthesis

Glycolysis

Citric Acid Cycle (Krebs cycle)

Synthesis of amino acids

Transamination

Synthesis of proteins and enzymes

Synthesis of coenzymes

Synthesis of structural materials

Duplication of genetic material

Reproduction of cells (growth)

Absorption of nutrients

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Qualitative/ Quantitative Analysis (Lecture 16)

The qualitative and quantitative distribution of thesemetabolites differs from plant to plant and part to part.Alkaloids found in low concentrations relative to thephenolic compounds are offset by their high biologicalpotency in vegetative tissues. Besides this, alkaloids arefound in higher concentration in storage tissues (roots,fruits and seeds) as compared to the green leaves(Walton and Brown, 1998). Alkaloids and glycosides arecomplex chemical substances and are distributed in largevarieties of the plants throughout the plant kingdom.Many of these alkaloids and glycosoides are poisonousbut still many are harmless and possess medicinalproperties if used in little amount. The amount ofpoisonous substances varies considerably from speciesto species and even from plant to plant, depending on theage and various ecological and climatic factors. Plants have limitless ability to synthesize aromaticsubstances, mostly phenols or their oxygen-substitutedderivatives. Most of the naturalproducts are secondary metabolites and about 12,000 ofsuch products have been isolated so far. These productsserve as plant defense mechanisms against predation bymicroorganisms, insects and herbivores.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Pharmaceutical and Industrial Applications of Carbohydrates (Lecture 17)

Biofuels eg bio-ethanol

Adhesives/glues

Hydrolysis industries for sorbitol, glucose etc

Pharmaceutical uses

Textile finishing

Paper manufacture

Plastics manufacture

Construction industry

Explosive manufacture

Leather finishing

Cosmetics industry

Automotive manufacture

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Pharmaceutical and Industrial Applications of Lipids (Lecture 18)

Increasing attention is being given to lipid nanocarriers (LNs) as drug delivery systems, due to the advantages offered of a higher biocompatibility and lower toxicity compared with polymeric nanoparticles. Many administration routes are being investigated for LNs, including topical, oral and parenteral ones. LNs are also proposed for specific applications such as cancer treatment, gene therapy, diagnosis and medical devices production. However, the high number of published research articles does not match an equal amount of patents. A recent Review of ours, published in Pharmaceutical Patent Analyst, reported the patents proposing novel methods for the production of LNs. This review work discusses recent patents, filed in 2007-2013 and dealing with the industrial applications of lipid-based nanocarriers for the vectorization of therapeutically relevant molecules, as well as biotech products such as proteins, gene material and vaccines, in the pharmaceutical, diagnostic and biomedical areas

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Pharmaceutical and Industrial Applications of Proteins(Lecture19)

Using combinatorial chemistry to generate novel binding molecules based on protein frameworks ('scaffolds') is a concept that has been strongly promoted during the past five years in both academia and industry. Non-antibody recognition proteins derive from different structural families and mimic the binding principle of immunoglobulins to varying degrees. In addition to the specific binding of a pre-defined target, these proteins provide favourable characteristics such as robustness, ease of modification and cost-efficient production. The broad spectrum of potential applications, including research tools, separomics, diagnostics and therapy, has led to the commercial exploitation of this technology by various small- and medium-sized companies. It is predicted that scaffold-based affinity reagents will broaden and complement applications that are presently covered by natural or recombinant antibodies. Here, we provide an overview on current approaches in the biotech industry, considering both scientific and commercial aspects.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Pharmaceutical and Industrial Applications of Derived Products (Lecture20)

A primary metabolite is a kind of metabolite that is directly involved in normal growth, development, and reproduction. It usually performs a physiological function in the organism (i.e. an intrinsic function). A primary metabolite is typically present in many organism or cell. It is also referred to as a central metabolite, which has an even more restricted meaning (present in any autonomously growing cell or organism).

Conversely, a secondary metabolite is not directly involved in those processes, but usually has an important ecological function (i.e. a relational function). A secondary metabolite is typically present in a taxonomically restricted set of organisms or cells (Plants, Fungi, Bacteria...).

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications.

Agar (Lecture21)

Synonym: Agar, Japanese, Isinglass.

Biological sources :

It is dried hydrophilic heteropolysaccharide product obtained by decoction of various species of red algae Rhodophyceae-class from 2 different genera → *Gelidium Plerocladia* → Family Gelidiaceau.

Chemical Constituents :

- It is heteropolysaccharide contains Ca salt of sulphuric ester of carbohydrate complex
- It has 2 principal constituent :
    - Agarose :
        - It is neutral polymer of galactose disaccharide known as agarobinose. Responsible for gel strength.
- Uses :
- Agar is used for preparation

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Guar gum (Lecture22)

Guar gum

Synonym : Gaur Gum, Jaguar gum, guar flour.

Biological sources:

Seed gum produced from endosperm of seed of cyamposis tetragonolobus → Leguminoceae

Characteristics:

Along with water Taste- mucilaginous gives → dispersion → aq. Dispersion are neutral.

Uses :

- Stabilizing , thickening agent.
- Better additive for improving quality of paper.
- Binding, disintegrating agent.
- Bulk laxative & appetite suppressant

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Acacia (Lecture23)

Acacia

Biological source- Acacia gum is a dried gum obtained from the stem & branches of *Acacia senegal* & some other spp of *Acacia* (Leguminoseae).

Properties- Cleaned (not bleached) Kordofan gum has few cracks on the surface → relatively transparent. Slightly pink-yellow in colour. Tears are usually not very uniform in size (some are quite small, others have a diameter of >4 cm). The better qualities of Senegal gum closely resemble the Kordofan - are vermiform in shape, and the gum is also more yellow in colour.

Chemical constituents- Consists mainly of arabin (Ca-salt [with traces of Mg & K] of arabic acid).

Uses- as a general stabilizer in emulsions, Lozenges, Demulcent properties → used in diarrhoea, coughs, sore throats

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.

2. Rangari: Pharmacognosy: Career Publications

Isapgol (Lecture24)

Synonym: Psyllium , Flea seeds.

B.S. : It consist of seeds of plantago psyllium linn or P.afra & also from other species like plantago indica

G.S.: South France , Spain , Cube , Europe & Egypt

Chemical Constituents :

- It contain mucilage in the epidermal layer.
- Mucilage after hydrolysis affords xylo, ardbinose, galactose & galacturonic acid.
- It contains fixed oils, sugars, proteins, sterols &
- Glycoside known as aucubin.

Uses:

- Bulk laxative.

Substituents & adulterants :

- Plantago lanceolata linn seeds known as ribwort has a very low swelling factor of 4.75.
- Yellowish brown colour may be mixed with psyllium.
- **References**

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune
2. Rangari: Pharmacognosy: Career Publications

Sterculia, Trgacanth (Lecture25)

Tragacanth

Biological source- dried exudate obtained after giving incisions on the stem bark *ofA. Gummifer* (Family Leguminosae).

Chemical Constituents-

A water-soluble fraction (tragacanthin)
A water-insoluble fraction (bassorin)
(Both these are insoluble in alcohol)
Sugar
Uronic acids
On hydrolysis:
Galacturonic acid
D-galactopyranose
L-arabinofuransoe
D- xylopyranose

Uses-

Uses as a suspending agent for insoluble powders, Binding agent in pills & tablets. ,Food industry - additive

Sterculia gum

Definition: Sterculia gum is the gummy exudate obtained from the tree, *Sterculia urens* (Sterculiaceae).

Good quality gum occurs in irregular, almost colourless, translucent, striated masses.

Sterculia gum has the distinct odour of acetic acid.

It contains Uronic acids

Partial hydrolysis yields

- D-galactose
- L-rhamnose
- D-galacturonic acid
- Acetic acid

Uses- Granular grades are used as a bulk laxative lozenges, pastes & denture fixture powders.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune
2. Rangari: Pharmacognosy: Career Publications

Okra mucilage (Lecture26)

Okra (US /ˈoʊkrə/ or UK /ˈɒkrə/; *Abelmoschus esculentus* Moench), known in many English-speaking countries as ladies' fingers, bhindi, bamia, or gumbo, is a flowering plant in the mallow family. It is valued for its edible green seed pods. The geographical origin of okra is disputed, with supporters of Guatemalan, West African, Ethiopian, Indian andBangladeshi origins. The plant is cultivated in tropical, subtropical and warm temperate regions around the world.

Okra is a popular health food due to its high fiber, vitamin C, and folate content. Okra is also known for being high in antioxidants. Okra is also a good source of calcium andpotassium.

Unspecified parts of the plant were reported in 1898 to possess diuretic properties;

Some studies are being developed targeting okra extract as remedy to managediabetes.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Starch (Lecture27)

Starch or amylum is a carbohydrate consisting of a large number of glucose units joined by glycosidic bonds. This polysaccharide is produced by most green plants as an energy store. It is the most common carbohydrate in human diets and is contained in large amounts in such staple foods as potatoes, wheat, maize (corn), rice, andcassava.

Pure starch is a white, tasteless and odorless powder that is insoluble in cold water or alcohol. It consists of two types of molecules: the linear and helical amylose and the branched amylopectin. Depending on the plant, starch generally contains 20 to 25% amylose and 75 to 80% amylopectin by weight. Glycogen, the glucose store of animals, is a more branched version of amylopectin.

Starch is processed to produce many of the sugars in processed foods. Dissolving starch in warm water gives wheatpaste, which can be used as a thickening, stiffening or gluing agent. The biggest industrial non-food use of starch is as adhesive in thepapermaking process. Starch can be applied to parts of some garments before ironing, to stiffen them.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Starch (Lecture28)

Starch or amylum is a carbohydrate consisting of a large number of glucose units joined by glycosidic bonds. This polysaccharide is produced by most green plants as an energy store. It is the most common carbohydrate in human diets and is contained in large amounts in such staple foods as potatoes, wheat, maize (corn), rice, andcassava.

Pure starch is a white, tasteless and odorless powder that is insoluble in cold water or alcohol. It consists of two types of molecules: the linear and helical amylose and the branched amylopectin. Depending on the plant, starch generally contains 20 to 25% amylose and 75 to 80% amylopectin by weight. Glycogen, the glucose store of animals, is a more branched version of amylopectin.

Starch is processed to produce many of the sugars in processed foods. Dissolving starch in warm water gives wheatpaste, which can be used as a thickening, stiffening or gluing agent. The biggest industrial non-food use of starch is as adhesive in thepapermaking process. Starch can be applied to parts of some garments before ironing, to stiffen them.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Chitosan and Cyclodextrins (Lecture29)

Chitosan is a linear polysaccharide composed of randomly distributed β-(1-4)-linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit). It is made by treating shrimp and other crustacean shells with the alkali sodium hydroxide.

Chitosan has a number of commercial and possible biomedical uses. It can be used in agriculture as a seed treatment and biopesticide, helping plants to fight off fungal infections. In winemaking it can be used as a fining agent, also helping to prevent spoilage. In industry, it can be used in a self-healing polyurethane paint coating. In medicine, it may be useful in bandages to reduce bleeding and as an antibacterial agent; it can also be used to help deliver drugs through the skin.

More controversially, chitosan has been asserted to have use in limiting fat absorption, which would make it useful for dieting, but there is evidence against this.

Other uses of chitosan that have been researched include use as a soluble dietary fiber.

Cyclodextrins are composed of 5 or more α-D-glucopyranoside units linked 1->4, as in amylose (a fragment of starch). The 5-membered macrocycle is not natural. Recently, the largest well-characterized cyclodextrin contains 32 1,4-anhydroglucopyranoside units, while as a poorly characterized mixture, at least 150-membered cyclic oligosaccharides are also known. Typical cyclodextrins contain a number of glucose monomers ranging from six to eight units in a ring, creating a cone shape:

- α (alpha)-cyclodextrin: 6-membered sugar ring molecule
- β (beta)-cyclodextrin: 7-membered sugar ring molecule
- γ (gamma)-cyclodextrin: 8-membered sugar ring molecule

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Castor oil, Linseed oil (Lecture30)

Castor oil:

Castor oil is a vegetable oil obtained by pressing the seeds of the castor oil plant (*Ricinus communis*). The common name "castor oil", from which the plant gets its name, probably comes from its use as a replacement for castoreum, a perfume base made from the driedperineal glands of the beaver (*castor* in Latin).

Castor oil is a colorless to very pale yellow liquid with a distinct taste and odor once first ingested. Its boiling point is 313 °C (595 °F) and its density is 961 kg/m^3. It is atriglyceride in which approximately 90 percent of fatty acid chains are ricinoleate. Oleateand linoleates are the other significant components. Castor oil and its derivatives are used in the manufacturing of soaps, lubricants, hydraulic and brake fluids, paints, dyes, coatings, inks, cold resistant plastics, waxes and polishes,nylon, pharmaceuticals and perfumes.

Linseed oil:

Linseed oil, also known as flaxseed oil is a colourless to yellowish oil obtained from the dried, ripened seeds of the flax plant (*Linum usitatissimum*, Linaceae). The oil is obtained by pressing, sometimes followed by solvent extraction. Flax-based oils are sought after as food because of their high levels of α-Linolenic acid (a particular form of omega-3 fatty acid), but it is important that only food-grade oil be used for food. Boiled linseed oil is heated and treated with chemicals that make it unfit for human consumption.

Linseed oil is a *drying oil*, meaning it can polymerize into a solid form. Due to its polymer-forming properties, linseed oil is used on its own or blended with other oils, resins, and solvents as an impregnator and varnish in wood finishing, as a pigment binder in oil paints, as a plasticizer and hardener in putty, and in the manufacture of linoleum. Linseed oil use has declined over the past several decades with increased availability of synthetic alkyd resins—which function similarly but resist yellowing. Linseed oil is an edible oil marketed as a nutritional supplement.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications .

Neem oil, Hydnocarpus oil (Lecture31)

Neem oil:

Neem oil is a vegetable oil pressed from the fruits and seeds of the neem (*Azadirachta indica*), an evergreen tree which is endemic to the Indian subcontinent and has been introduced to many other areas in the tropics. It is the most important of the commercially available products of neem for organic farming and medicines.

Neem oil varies in color; it can be golden yellow, yellowish brown, reddish brown, dark brown, greenish brown, or bright red. It has a rather strong odor that is said to combine the odours ofpeanut and garlic. It is composed mainly of triglycerides and contains many triterpenoidcompounds, which are responsible for the bitter taste. It is hydrophobic in nature; in order toemulsify it in water for application purposes, it must be formulated with appropriate surfactants.

Azadirachtin is the most well known and studied triterpenoid in neem oil. The azadirachtin content of neem oil varies from 300ppm to over 2500ppm depending on the extraction technology and quality of the neem seeds crushed. Neem oil also contains steroids(campesterol, beta-sitosterol, stigmasterol).

Hydnacarpus oil:

Hydnocarpus is a genus of medium to large trees of Indonesia, Malaysia and thePhilippines, having alternate leaves, small dioecious racemose flowers, and capsular fruits of which several are sources of chaulmoogra oil and hydnocarpus oil.

Chaulmoogra oil, extracted from *H. wightiana* was an early treatment for leprosy.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Codliver oil, Sharkliver oil (Lecture32)

Codliver oil:

Cod liver oil is a nutritional supplement derived from liver of cod fish. As with most fish oils, it has high levels of the omega-3 fatty acids, eicosapentaenoic acid (EPA) anddocosahexaenoic acid (DHA). Cod liver oil also contains vitamin A and vitamin D. It has historically been taken because of its vitamin A and vitamin D content. It was once commonly given to children, because vitamin D has been shown to prevent rickets and other symptoms of vitamin D deficiency.

Sharkliver oil:

Shark liver oil is an oil obtained from the livers of sharks. It has been used for centuries as a folk remedy to promote the healing of wounds and as a remedy for respiratory tract and digestive system problems. It is still promoted as a dietary supplement, and additional claims have been made that it can treat other maladies such as cancer, HIV, radiation illness, swine flu and the common cold. To date, none of these claims have been medically validated and shark liver oil (alone) is not a medication prescribed or utilized by American physicians. However, it is a component of some moisturizing skin lotions, and some hemorrhoid medications

Most shark liver oil supplements have not been tested to find out if they interact with medicines, foods, or other herbs and supplements. Even though some reports of interactions and harmful effects may be published, full studies of interactions and effects are not often available. Although many people have taken shark liver oil, the issue of potential toxicity at the usual doses has not been well studied. Some mild digestive problems such as nausea, upset stomach, and diarrhea have been reported. The safe range of doses for shark liver oil has not yet being determined, though overdosing can have toxic consequences.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Rice bran oil, Coca butter (Lecture33)

Rice bran oil is the oil extracted from the hard outer brown layer of rice after chaff (rice husk). It is notable for its high smoke point of 232 °C (450 °F)

Rice bran oil has a composition similar to that of peanut oil, with 38% monounsaturated, 37% polyunsaturated, and 25% saturated fatty acids.

The component of rice bran oil is the antioxidant γ-oryzanol, at around 2% of crude oil content. Thought to be a single compound when initially isolated, it is now known to be a mixture of steryl and other triterpenyl esters of ferulic acids. Also significant is the relatively high fractions of tocopherols and tocotrienols, together as vitamin E. Rice bran oil is also rich in other phytosterols.

Cocoa butter, also called theobroma oil, is a pale-yellow, edible vegetable fatextracted from the cocoa bean. It is used to make chocolate, as well as someointments, toiletries, and pharmaceuticals.

Cocoa butter is obtained from whole cocoa beans, which are fermented, roasted, and then separated from their hulls. About 54–58% of the residue is cocoa butter.

Pharmaceutical companies heavily use cocoa butter's physical properties. As a nontoxic solid at room temperature that melts at body temperature, it is considered an ideal base for medicinal suppositories.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Kokum butter, Wool fat, Bees wax (Lecture34)

Garcinia indica, a plant in the mangosteen family (Clusiaceae), commonly known as*kokum*, is a fruit-bearing tree that has culinary, pharmaceutical, and industrial uses.

The seed of *Garcinia indica* contains 23–26% oil, which remains solid at room temperature. It is used in the preparation of confectionery, medicines and cosmetics.

Recently, industries have started extracting hydroxycitric acid (HCA) from the rind of the fruit.

Lanolin ("olive oil"), also called wool wax or wool grease, is a yellow waxy substance secreted by the sebaceous glands of wool-bearing animals. Most lanolin used by humans comes from domestic sheepbreeds that are raised specifically for their wool. Lanolin is a wax. Historically, many pharmacopoeias have referred to lanolin as wool fat (*adeps lanae*); however, as lanolin lacks glycerides (glycerol esters), it is not a true fat. Lanolin primarily consists ofsterol esters.

Beeswax is a natural wax produced in the bee hive of honey bees of the genus *Apis*. It is mainly esters of fatty acids and various long-chain alcohols.

Small amounts of beeswax have food and flavoring applications, and are edible in the sense of having similar toxicity to undigestable plant waxes. However, the wax monoesters in beeswax are poorly hydrolysed in the guts of humans and mammals, so are of not considered a significant food value.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Lecithin (Lecture35)

Lecithin

It is a generic term to designate any group of yellow-brownish fatty substances occurring in animal and plant tissues composed of phosphoric acid,choline, fatty acids, glycerol, glycolipids, triglycerides, and phospholipids (e.g., phosphatidylcholine,phosphatidylethanolamine, and phosphatidylinositol).

Lecithin can easily be extracted chemically (using hexane, ethanol, acetone, petroleum ether, benzene, etc.) or mechanically. It is usually available from sources such as soybeans, eggs, milk, marine sources, rapeseed, cottonseed, and sunflower. It has low solubility in water, but is an excellent emulsifier. In aqueous solution, its phospholipids can form either liposomes, bilayer sheets,micelles, or lamellar structures, depending on hydration and temperature. This results in a type of surfactant that usually is classified as amphipathic. Lecithin is sold as a food supplement and for medical uses.

- In the pharmaceutical industry, it acts as a wetting, stabilizing agent and a choline enrichment carrier, helps in emulsifications and encapsulation, and is a good dispersing agent. It can be used in manufacture of intravenous fat infusions and for therapeutic use.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Polyunsaturated Fatty Acids (Lecture36)

Polyunsaturated fatty acids (PUFAs) are fatty acids that contain more than one double bond in their backbone. This class includes many important compounds, such as essential fatty acids and those that give drying oils their characteristic property.

Polyunsaturated fatty acids can be classified in various groups by their chemical structure:

- methylene-interrupted polyenes
- conjugated fatty acids
- other PUFAs

Common nameLipid nameChemical nameHexadecatrienoic acid (HTA)16:3 (n-3)*all-cis* 7,10,13-hexadecatrienoic acidAlpha-linolenic acid (ALA)18:3 (n-3)*all-cis*-9,12,15-octadecatrienoic acidStearidonic acid (SDA)18:4 (n-3)*all-cis*-6,9,12,15,-octadecatetraenoic acidEicosatrienoic acid (ETE)20:3 (n-3)*all-cis*-11,14,17-eicosatrienoic acidEicosatetraenoic acid (ETA)20:4 (n-3)*all-cis*-8,11,14,17-eicosatetraenoic acidEicosapentaenoic acid (EPA, Timnodonic acid)20:5 (n-3)*all-cis*-5,8,11,14,17-eicosapentaenoic acidHeneicosapentaenoic acid (HPA)21:5 (n-3)*all-cis*-6,9,12,15,18-heneicosapentaenoic acidDocosapentaenoic acid (DPA, Clupanodonic acid)22:5 (n-3)*all-cis*-7,10,13,16,19-docosapentaenoic acidDocosahexaenoic acid (DHA, Cervonic acid)22:6 (n-3)*all-cis*-4,7,10,13,16,19-docosahexaenoic acidTetracosapentaenoic acid24:5 (n-3)*all-cis*-9,12,15,18,21-tetracosapentaenoic acidTetracosahexaenoic acid (Nisinic acid)24:6 (n-3)*all-cis*-6,9,12,15,18,21-tetracosahexaenoic acid.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Carotenoids (Lecture37)

Carotenoids are natural pigments which are synthesized by plants and are responsible for the bright colors of various fruits and vegetables. There are several dozen carotenoids in the foods that we eat, and most of these carotenoids have antioxidant activity. Beta-carotene has been best studied since, in most countries it is the most common carotenoid in fruits and vegetables. However, in the U.S., lycopene from tomatoes now is consumed in approximately the same amount as beta-carotene. Antioxidants (including carotenoids) have been studied for their ability to prevent chronic disease. Beta-carotene and others carotenoids have antioxidant properties in vitro and in animal models. Mixtures of carotenoids or associations with others antioxidants (e.g. vitamin E) can increase their activity against free radicals. The use of animals models for studying carotenoids is limited since most of the animals do not absorb or metabolize carotenoids similarly to humans. Epidemiologic studies have shown an inverse relationship between presence of various cancers and dietary carotenoids or blood carotenoid levels. However, three out of four intervention trials using high dose beta-carotene supplements did not show protective effects against cancer or cardiovascular disease. Rather, the high risk population (smokers and asbestos workers) in these intervention trials showed an increase in cancer and angina cases. It appears that carotenoids (including beta-carotene) can promote health when taken at dietary levels, but may have adverse effects when taken in high dose by subjects who smoke or who have been exposed to asbestos. It will be the task of ongoing and future studies to define the populations that can benefit from carotenoids and to define the proper doses, lengths of treatment, and whether mixtures, rather than single carotenoids (e.g. beta-carotene) are more advantageous.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications .

Thaumatin (Lecture38)

Thaumatin is a low-calorie sweetener and flavour modifier. The protein is often used primarily for its flavour-modifying properties and not exclusively as a sweetener. The thaumatins were first found as a mixture of proteins isolated from the katemfe fruit (*Thaumatococcus daniellii* Bennett) of west Africa. Some proteins in the thaumatin family of sweeteners are roughly 2000 times more potent than sugar.

The fruit's seeds are encased in a membranous sac, or aril, that is the source of thaumatin. In the 1970s, Tate and Lyle began extracting thaumatin from the fruit. In 1990, researchers at Unilever reported the isolation and sequencing of the two principal proteins found in thaumatin, which they dubbed thaumatin I and thaumatin II. These researchers were also able to express thaumatin ingenetically engineered bacteria.

Since thaumatin crystallizes rapidly and easily in the presence of tartrate ions, thaumatin-tartrate mixtures are frequently used as model systems to study protein crystallization.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Papain (Lecture39)

Papain, also known as papaya proteinase I, is a cysteine protease enzyme present in papaya (*Carica papaya*).

The papain precursor protein contains 345 amino acid residues, and consists of a signal sequence (1-18), a propeptide (19-133) and the mature peptide (134-345). The amino acid numbers are based on the mature peptide. The protein is stabilised by three disulfide bridges.

It is mainly used as an ingredient in various enzymatic debriding preparations, notably Accuzyme. These are used in the care of some chronic wounds to clean up dead tissue.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Bromelin (Lecture40)

Bromelain is an extract derived from the stems of pineapples, although it exists in all parts of the fresh plant and fruit, which has many uses. The extract has a history of folk and modern medicinal use. As a supplement, it is thought to have anti-inflammatory effects. Bromelain also contains chemicals that might interfere with the growth of tumor cells and slow blood clotting, but no peer-reviewed research shows any efficacy against tumors. As a culinary ingredient, it is used primarily as a tenderizer.

The term "bromelain" may refer to either of two protease enzymes extracted from the plants of the family Bromeliaceae, or it may refer to a combination of those enzymes along with other compounds produced in an extract.

The US National Institute of Health rates bromelain as only possibly effective againstosteoarthritis, but only when taken in combination with trypsin and rutin (Phlogenzym). The same institute has stated it is possibly ineffective for preventing postexercise muscle tiredness. In addition, no evidence indicates efficacy of the product for any other disorder.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications .

Streptokinase, Gelatin (Lecture41)

Streptokinase

Streptokinase (SK) is an enzyme secreted by several species of streptococci that can bind and activate human plasminogen. SK is used as an effective and inexpensivethrombolysis medication in some cases of myocardial infarction (heart attack) andpulmonary embolism. Streptokinase belongs to a group of medications known asfibrinolytics, and complexes of streptokinase with human plasminogen can hydrolytically activate other unbound plasminogen by activating through bond cleavageto produce plasmin. There are three domains to Streptokinase, denoted α (residues 1–150), β (residues 151–287), and γ (residues 288–414). Each domain binds plasminogen, although none can activate plasminogen independently.

Gelatin

Gelatin or gelatine (from Latin: *gelatus* meaning "stiff", "frozen") is a translucent, colourless, brittle (when dry), flavourless foodstuff, derived from collagen obtained from various animal by-products. It is commonly used as a gelling agent in food,pharmaceuticals, photography, and cosmetic manufacturing. Substances containing gelatin or functioning in a similar way are called *gelatinous*. Gelatin is an irreversibly hydrolysedform of collagen. It is found in marshmallows, gelatin dessert, and some ice cream, dip and yogurt. Household gelatin comes in the form of sheets, granules, or powder.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Cotton (Lecture42)

Synonym: Row cotton, Cotton wool, Purified cotton, Absorbent cotton, Surgical cotton.

Biological sources: Cotton consist of the epidermal fibers present on the seed

Gossypium Barbddens Linn., G. herbuceum and *G. Peruvianum*

Family: *Malvaceae*

Geographical Source: Cotton is produced commercially in Egypt, U.S.A. and India. It is also cultivated in various parts of Africa &south America.

Chemical constitues:

- Absorbent cotton wool is almost pure cellulose while raw cotton contains about 90% of cellulose.
- Cellulose is made up of linear chains of β-1-4 linked glucose residue.
- The repeating unit of this polysaccharide structure is constituted of two glucose residues known as cello bi nose cotton wool shows 6-7% moisture content 0.1 to 0.3% .

Uses:

- Absorbent cotton wool is used as an important material for surgical dressing in variety of forms.
- It is also modified by chemical reactions to afford cellulose derivatives of specific qualities.
- It also used as a filtering medium & an insulating material.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Wool (Lecture43)

- **Synonym:** Animal wool, Sheep wool.
- **Biological Sources:** Animal wool is prepared from the fleece of the sheep ovisarises *Linn.*
- ***Family*** *- Bovidae*
- **Geographical source :** wool is produced in most of the world. It is imported chiefly from Australia, USA, Argentina, India, & Rassia

Chemical constituesnts:

Wool fibers are made up of protein keratin is found in two variation i.e. unstable β-keratin and stable α-keratin.

- It contains fairly large amount of sulfur containing amino acid-cystine.

Uses:

- Animal wool is used as filtering and staining agent.
- It is used in expel bandages flannel and domette.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications .

Silk (Lecture44)

- **Synonym:** Silk.
- **Biological source:** Silk fibers are produced from the cocoons of *Bombyxmori*, the mulberry silk worm & also from other species of *Bombyx.*
- **Family-** Bombycid order Lepidoptera.
- **Geographical Source:** Silk is produced on large scale in China, India, Italy, France & many other countries. Best quality of silk come from France & Italy. In India it is produced in Jammu & Kashmir, Karnataka & Tamilnadu.
- **Chemical constituesnts:**
- Mulberry silk & other silks contains chiefly of the protein fibroin as a fibrous mass.
- It is glued externally by a layer of another protein servicing or silk glue.
- Silk glue is removed during preparation of silk as it is soluble in water.
- Unlike keratin, protein fibroin shows the absence of sulfur containing amino acid.
- Uses:
- Silk is used for the manufacture of ligatures and oiled silk.
- It is also useful in making special sieves for filtration and also sutures special type.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Jute (Lecture45)

- **Synonym:** Jute, Gunny.
- **Biological source:** Jute fibers consist of long strand of phloem fibers obtained from the stem of *Corchoru solitaries & C. capsular is Linn*.

- **Family :** *Tiliaceae*.
- **Geographical Source**: Jute is chiefly cultivated in Bengal in India in the river basins of Ganges & Brahmaputra. It is also produced in Assam, Orissa & Bihar.
- Large production is also done in Bangladesh.
- **Chemical constituesnts:**
- Phloem fiber of the jute are composed or lingo cellulose.
- It contains about 53% cellulose, 22% hemi cellulose & about 11% lignin, moisture content is 12-13% with trace of fats & waxes.
- **Uses:**
- Jute fibers are used for the manufacture of medicated two for with short jute fibers are used padding splints are also produced from jute.
- It is used as a filtering medium.
- Jute is largely span into yarn & make into sackings & hessian.

References

1. Kokate, Purohit, Gokhale: Pharmacognosy: Nirali Prakashan, Pune.
2. Rangari: Pharmacognosy: Career Publications

Class- *III sem B.Pharm* ***Subject- Pcog & Phytochem I***

Subject Incharge- Ms. Upadhye M. C. ***LECTURE SYNOPSIS***