Shree H.N.Shukla institute of Pharmaceutical Education & Research Rajkot

B.Pharm

Semester III

Subject Name: Pharmacognosy and Phytochemistry I
Subject code: BP305TP

HNSIPER

Chapter 5

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs.

Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey, Starch, Sodium alginate, Pectin, Guar gum

Proteins & Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids (Waxes, fats, fixed oils): Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

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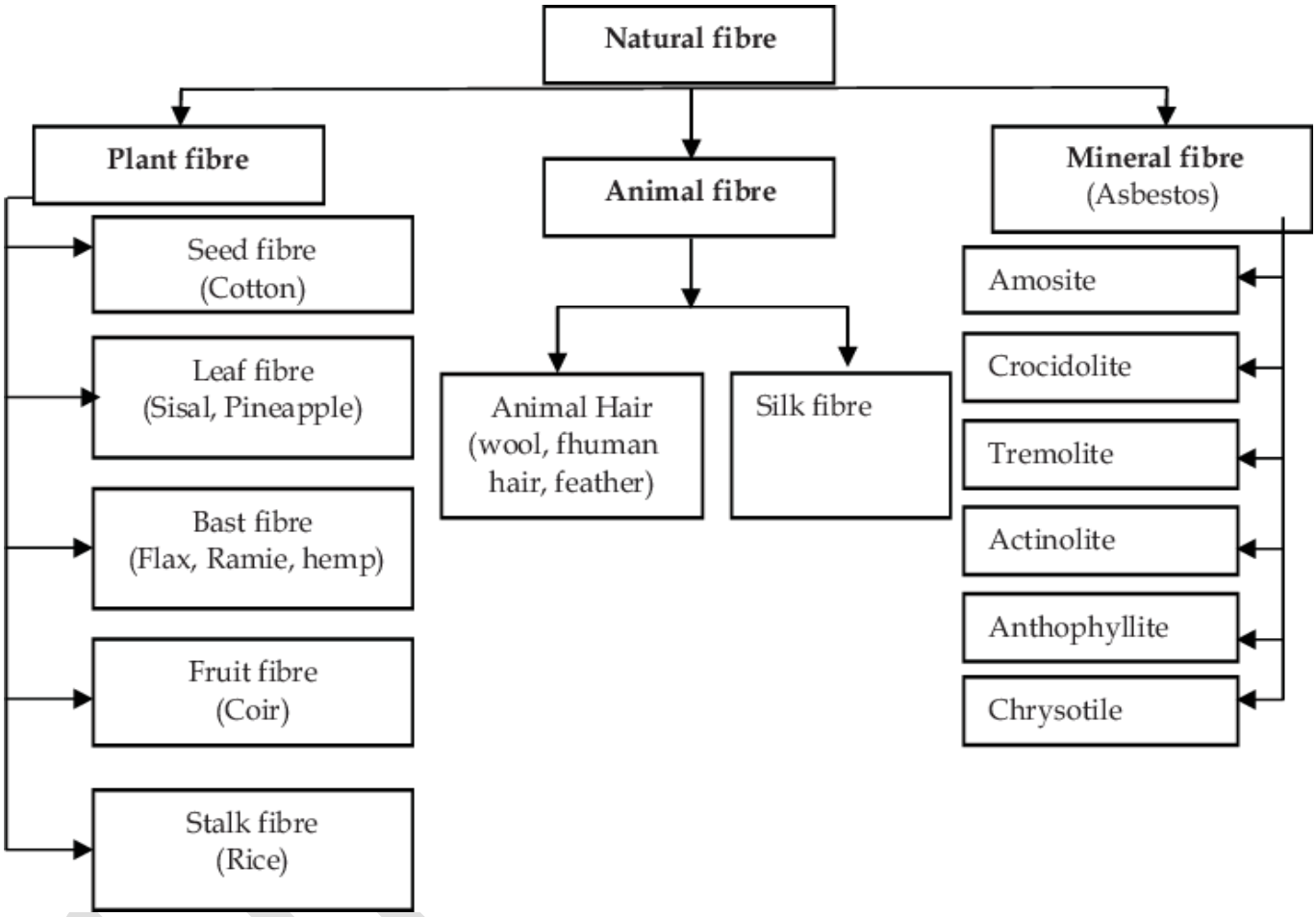
Fibers

Fibres, used in surgical dressings, are obtained from plant, animal or are man-made

Classifiacation of Fibres



Vegetable fibres and regenerated cellulosic fibres:

They are cellulosic, therefore they can be distinguished from animal fibres by the following tests:

1. Molisch's test (with α-napthol and H_2SO_4) give Violet colour.
2. With chlor-zinc iodine or Iodine and H_2SO_4 give Blue colour.
3. When ignited No foul smell. Lipids (waxes, fats, fixed oils)

Animal fibres:

They can be distinguished from vegetable fibres by the following tests:

1. When ignited give Unpleasant smell.
2. In 5% KOH give Soluble.
3. With Picric acid give Stained permanently (Yellow colour).

4. With Millon's reagent give Yellow colour.

Cotton

Types of Cotton:

It of two types: Raw Cotton e.g Cotton wool)and and Absorbent Cotton. (Raw Cotton)

Biological source: The hairs covering the seeds of various species of Gossypium particularly *Gossypium herbaceum* Linn. and their hybrids.

Family : Malvaceae

G. S. : USA, Egypt, India, South America

Cultivation :

• Plants are herbaceous or woody according to the species.

• In warm climates, the plant is perennial, but it is always grown as annual due to its susceptibility to attack by insects.

• Soil: Sands and loams (rich alluvial deposits)

• Seeds are sown in rows 3 to 5 ft. apart.

• Seedling are thinned out from 1 to 2 ft. apart .

• Manure: Initially nitrogenous, and later on phosphatic.

• The Plant after flowering, bears fruits known as Capsules or "bolls".

Collection & Preparation

•After ripening, the fruits dehisce by 3 to 5 valves, exposing the seed which are covered with the trichomes.

• These are collected, dried & transferred to a "gin", where the trichomes are separated from the seeds.

• The felted "lint" is made into bales by hydraulic pressure.

Preparation of cotton for surgical use:

• Absorbent cotton wool is made from cotton waste.

• It is processed to get rid of most of the impurities, followed by boiling with 5% solution of caustic soda for 15 hours at

a pressure of 1 to 3 atmospheres.

• It is then washed with water & treated with suitable bleaching agent.

• It is further washed with water, and treated with dil. HCl and again washed with water

• Then, it is dried & carded into Flat sheets and finally packed.

Morphological Characters:

Raw Cotton:

It consists of a mass of soft brownish filaments. Each filament may be upto 4 cm in length and contains many impurities like

colouring matter, wax and fatty material.

Absorbent cotton:

It is raw cotton which has been freed from seeds, treated with alkali to remove the fatty cuticle, bleached, washed and
separated to produce a fleecy mass of soft white filaments. It is reasonably free from leaf, shell, fibre, dust and foreign
matter, made from comber waste.

Microscopical Characters:

Each filament consists of flattened, twisted, tubular trichomes. The edges are rounded and the thickness of the trichome
wall appears as a thickened margin. The apex is rounded and occasionally solid.
Each trichome consists of a single cell, 2 to 4 cm in length and 15 to 20 μ in breadth.

Chemical Constituents:

Raw Cotton:
Cellulose (91%), Wax, Oil, Fat (0.4%), Protoplasm and other cell contents (0.6%) Moisture (7.8%), Ash (0.2%)
Purified Absorbent Cotton:
Almost pure cellulose, Moisture (6 to 7%), Ash (0.1 to 0.3%)

Physical test:

Absorbency test:
1g of cotton wool, compressed to a volume of about 20 ml and placed tightly by means of forceps on the surface of water
at about 20˚C :
Raw cotton ⟶ Float on surface of water.
Absorbent cotton ⟶ Sink or becomes saturated within 10 seconds

Chemical tests:

1. Moisten few threads of cotton wool with alcohol and mount in water. Irrigate the preparation with ammoniacal solution of copper oxide (cuoxam) under high power. Observe the slide

- Raw Cotton Develops balloon-like swellings separated by ring- shaped constricting bands formed by the cuticle
- Absorbent Cotton Swells uniformly and eventually dissolve

2. When the trichomes of raw cotton are soaked in aqueous ruthenium red (8 mg in 100 ml), the excess of reagent removed and cuoxam added, the cuticle is stained red and can be seen shrinking back to form constricting bands, while the inner layers of wall swell to form globular enlargements. This indicates that the cutin is distributed throughout the primary wall which contains pectin substances.

3. Mount a few threads in following reagents and observe microscopically any change in appearance:

(a) Solution of 5% KOH Does not dissolve.
(b) 66% v/v H_2SO_4 Dissolve rapidly.
(c) Phloroglucinol and HCl No red colouration (due to absence of lignification).

(d) In HCl Insoluble.

4. Mount a few threads in saturated aqueous solution of picric acid and allow to stand. Irrigate with water and observe.

No permanent staining takes place (because protein is absent).

5. Soak a few threads in iodine water for few minutes. Remove excess fluid and add 66% v/v H2SO4. Cotton is stained blue (due to presence of cellulose).

6. Warm a few threads on a slide with Millon's reagent No red colour (due to absence of Protein). 8. Boil a few threads of cotton wool for 1 minute in water. Transfer to cold, fresh Shirlastain C and stir occasionally for 5 minutes. Wash thoroughly with water and dry. Observe the resulting staining of the cotton.

Raw cotton ⟶ Mauve.

Absorbent cotton ⟶ Greyish pink.

7. Boil a few threads of cotton wool in water for 1 minute. Transfer to cold, fresh Shirlastain A and stir for 1 minute.

Wash thoroughly with water and dry. Observe the resulting staining of the cotton.

Raw cotton ⟶ Pale dusty purple.

Absorbent cotton ⟶ Lilac colour (light purple).

Uses:

• Pharmaceutically, as a filtering medium.

• In surgical dressings.

• As an insulating material.

• Absorbent Cotton absorbs blood, mucus, pus and prevents wounds from infections by bacteria.

Storage:

- It should be stored in cool, at a moisture content below 9%.
- Heat renders absorbent cotton non-absorbent.
- Absorbent cotton should be wrapped in papers so as to prevent the dust and microbial contamination

Jute

Jute is a long, soft, shiny vegetable fibre which can be spun into coarse, strong threads.After cotton, jute is the most economical natural fibre to be produced. Industrially. jute fibre is termed as raw jute.

Biological Source: It is the phloem fibres of the stem of various species of *Corchorus* (*Corchorus olitorius* and *Corchorus capsularis* Linn.) belonging to the family Tiliaceae

Geographical Source:The jute plants are cultivated in West Bengal, in the basins of Ganges and in Assam.They grow abundantly in areas having loamy alluvial soil with pH values of 6 to 8.

Cultivation and Collection

Jute is a rainy season crop sown in the months of March to May depending on the amount of rainfall and types of land .Harvesting is done from June to September depending on whether the seeds

were sown early or late. A warm and humid climate with temperature ranging between 24-37°C is preferred. Constant rain or water-logging areas are not ideal for its growth.

Sowing of jute in madlands and highlands is started with showers in March or April and Continue till early June in the western part of the jute belt. Farm yard Manure,phosphorus. potash, and nitrogen fertilizers are used. Inter-culturing is done in the early stage.

Harvesting of jute is done any time between 120-150 days when the flowers have shed.Early Harvesting gives food healthy fibres. Around, 8-12 feet high plants are cut at or close the ground level using sickles. In flooded land, plants are uprooted. The harvested plants are left in the field for 3 days under leaves shed. Thereafter the stems are packed in bundle for steeping in water which should be carried out immediately after harvesting.

organoleptic Properties

Jute fibres have the following organoleptic properties:

1) Jute Fibres: Off-white to brown coloured and 1-4m (3-12 feet) long.
2) Jute Plants: 2-4m high annual herbs, usually un-branched. or only a few e branches are present.

3) Leaves: Alternate, simple, lanceolate, 5-15cm long and have a finely serrated or Lobed margin

4) Flowers:Small,yellow colored, 1.5-3 cm in diameter, and have 5 petals

5) Fruits: Enclose many seeds within a capsule

Microscopic Properties

A Thin transverse section of a jute strand is treated with phloroglucinol and HCL. The Strands attain deep red color indicating the presence of lignin. Each strand consist of polygonal cells surrounded by the variably sized lumen. These strands can be separated by treatment with potassium chloride and nitric acid mixture.

Chemical Nature

Jute fibre consist of cellulose (50-53%), hemicellulose (nearly 20%), and lignin (10-11%),fats,wax and Ash(1% of each)are present. Other constituents like moisture (not more than 12-13 %), fats, wax, and ash are preasnt.

Identification Tests

Jute fibres can be identified by the following tests

- Feeling Test: It is stiff and harsh to the human skin
- Burning Test: It does not melt on burning: in fact it barns easily with smell of paper burning due to the presence of cellulose.
- Microscopic Identification: Its microscopic structure consists of a polygonal shaped cross-section and many ultimate cells of longitudinal view.
- Solubility: It dissolves in H_2SO_4

Uses

Jute has the following uses:

1) It is used for making craft items.

2) It is used for making socks, bags, carpets, curtains, ropes, etc
3) It is used for making sacks used for storing grains
4) It is used for manufacturing tows (stupa: wet cloth or sponge charged with medication for external application), padding splints, filtering and staining medium

Carbohydrates

Carbohydrates & its Derivatives:

Carbohydrates are defined as group of compound composed of C, H & O. They are expressed by the molecular formula $(CH_2O)_n$. They are also known as polyhydroxy aldehyde or polyhydroxy ketone or compound which on hydrolysis produces aldehyde & ketone. They are abundantly present in plants rather than in animals.

They are classified into two major groups:

Simple sugar: also known as saccharides. E.g. Glucose, Fructose, galactose.

Polysaccharides: e.g. Cellulose, Starch, Pectin, Gums, Inulin.

Monosaccharides:

Monosaccharides are sugar which can not be hydrolyzed further. Monosaccharides are classified a further as follows depending upon the no. of carbon atom in the sugar molecular.

- **Biose**: They contain two carbon atom & occur free in nature.
- **Trioses**:They contain three carbon atom but in the form of phosphoric ester. e.g. Glyceraldehydes
- **Tetroses**: They contain four carbon atoms. e.g. Erythrose.
- **Pentoses**: They are very common in plant & are product of hydrolysis of polysaccharides like gums, mucilage & hemi cellulose. e.g. Arabinose, Ribose, Xylose.
- **Hexoses**: They contain six carbon atoms & are present in high quantity in plant kingdom. They are classified into two major classes.
  - Aldose: Glucose, Galactose, Mannose.
  - Kitose: Fructose, Sorbose.
- **Heptose**: They contain seven carbon atoms & it is important in the photosynthesis of plant & glucose metabolism in animal. It is rarely found accumulated in the plant. e.g. Glucoheptose, Manoheptose.

Disaccharides:

Disaccharides yield two Monosaccharides on hydrolysis. e.g.

Maltose ⟶ Glucose + Glucose

Sucrose ⟶ Glucose + Fructose

Trisaccharides:

Trisaccharides yield three molecules of Monosaccharides on hydrolysis. e.g.

Gentianose ⟶ Glucose + Glucose + Fructose

Raffinose ⟶ Glucose + Galactose + Fructose.

Tetrasaccharides:

Tetrasaccharides yield four molecules of Monosaccharides. e.g. Stachyose

Polysaccharides:

Polysaccharides on hydrolysis give indefinite no. of monosaccharides. Depending on the product of hydrolysis. They are classified as follows;

1 **Pentasan** e.g. Xylan

2 **Hexosan** e.g. Starch, Cellulose, Inulin.

Polysaccharides, gums & mucilage are other important polysaccharides derivatives. Gums are also known as abnormal product or pathological product because they are secreted from the plant when there is injury to the plant. Hence, we can say that gum is produced to product the plant from injury.Mucilage is also known as physiological product or normal product of the plant. They are the plant exudates which are already present in the plant & product without any injury to the plant.

The exudation of gum from injured part of the plants is also known as Gummosis.

Gums are classified as follows;

1 **Natural gum**: e.g. Algin, Acacia, Tragacanth, Isabgol, Guargum, Pectin.

2 **Prepared gum**: e.g. Cellulose derivative, Starch & its derivatives, Xenthan, Dextran.

Chemical test for carbohydrates:

1. **Fehling's test:**

To a heated solution of the substance add drop by drop a mixture of equal parts of Fehling's solution No. 1 and No. 2. In certain cases reduction takes place near the boiling point and is shown by a brick-red precipitate of cuprous oxide. Reducing sugars include all monosaccharides many disaccharides(e.g. lactose, maltose, cellobiose and gentiobiose). Non-reducing substances include some disaccharides (sucrose and trehalose, the latter a sugar found in some fungi) and polysaccharides. Non-reducing carbohydrates will on boiling with acids be converted into reducing sugars, but students are reminded to neutralize any acid used for hydrolysis before testing with Fehling's solution, or cuprous oxide will fail to precipitate.

2. **Molisch's test:**

All carbohydrates give a purple colour when treated with α-naphthol and concentrated sulphuric acid. With a soluble carbohydrate this appears as a ring if the sulphuric acid is gently poured in to form a layer below the aqueous solution. With an insoluble carbohydrate such as cotton-wool (cellulose) the colour will not appear until the acid layer is shaken to bring it in contact with the material.

3. **Osazone formation test:**

Osazones are sugar derivatives formed by heating a sugar solution with phenylhydrazine hydrochloride, sodium acetate and acetic acid. If the yellow crystals which form are examined under the microscope they are sufficiently characteristic for certain sugars to be identified. It should be noted that glucose and fructose form the same osazone (glucosazone m.p. 205°C). Before melting points are taken, osazones should be purified by recrystallization from alcohol. Sucrose does not form an osazone, but under the conditions of the above test sufficient hydrolysis takes place for the production of glucosazone.

4. **Resorcinol test for ketones:**

   This is known as Selivanoff's test. A crystal of resorcinol is added to the soiution and warmed on a water-bath with an equal volume of concentrated hydrochloric acid. A rose colour is produced if a ketone is present (e.g. fructose, honey or hydrolysed inulin).

5. **Test for pentoses.**

   Heat a solution of the substance in a test-tube with an equal volume of hydrochloric acid containing a little phloroglucinol. Formation of a red colour indicates pentoses.

6. **Keller-Kiliani test for deoxysugars.**

   Deoxysugars are found in cardiac glycosides such as those of Digitalis and Strophanthus spp. The sugar is dissolved in acetic acid containing a trace of ferric chloride and transferred to the surface of concentrated sulphuric acid. At the junction of the liquids a reddish-brown colour is produced which gradually becomes blue.

7. **Enzyme reactions:**

   Since certain carbohydrate reactions are only brought about by certain specific enzymes, such enzymes may be used for identification.

8. **Benedict's test:**

   Glucose is heated with Benedict's reagent ($CuSO_4$, NaOH, and tartaric acid) to form a brick red precipitate. Source does not react under therse conditions. Fructose does form a red precipitate with Benedict's reagent.

9. **Tollen's test:**

   Heat the sample solution containing fructose, glucose maltose and lactose with tollen's reagent, silver mirror will appear.

10. **Barfoed's test:**

11. **Red precipitate will be formed when fructose or glucose solution is heated with barfoed's reagent**

12. **Anthron's test:**

    To 2 ml of amthrone reagent (0.2% in conc. H_2SO_4) 0.2 ml of the sugar solution is added. A blue – green colour is given by glucose and polysaccharides containg glucose. Different colours are obtained with different sugars. This test is generally used for hexoses and hexose containing polysaccharides.

13. **Bial's test:**

    5 ml of the Bial's reagent (solution of orcinol in 30% HCl containg a little ferric chloride) is heated to boling and a few drops of the sugar solution is added. Pentoses and aldohexuronic acids (which are converted to pentoses) give a green colour. Pentoses can be distinguished from hexoses by this test.

ACACIA GUM

Synonyms: Gum Arabic, Acaciae gummi

Biological source: It is the dried gummy exudation obtained from stem and branches of *Acacia Senegal*
Wild. and of some other species of Acacia.
Family: Leguminosae
Geographical source: *A. Senegal* is a tree about 6 m high, which is abundant in the Sudan, particularly, in the province of Kordofan in central Africa and in West Africa. It has also obtained in small quantaties, from Senegal, Mali, Mauritania and Niger.
History:

Gum was brought from the Gulf of Aden to Egypt in the seventeenth century B C. and in the works of Theophrastus it is spoken of as a product of Upper Egypt. The West African product was imported by the Portuguese in the fifteenth century. Until quite recently commerce in the Sudan was in the hands of a number of local merchants.
Collection and preparation:

It is a thorny tree upto 5 – 6 mteters in height. The best gum is produced near Kordofan from trees which are specialy cultivated for gum while in Senegambia, due to the extremes of climate, cracks are produced in the tree and the gums exudes out. Gum yields are improved by natural factors like hot weather, poor soil, lack of moisture, etc. Which lessen the vitality of the trees. It can be cultivated by seed sowing method in poor, exhausted soil without any minerals. Gum is collected twice a year from 6 – 8 years old trees, under dry weather in the month of November or in February – March.
The trees are properly pruned from dead wood and the lower thorny branches cut with an axe to facilitate the working nd for free air and light admit, 2- 3 inches broad incision on the stem and branches are made taking care that no injury is produced on cambium and xylem. It is to be remembered that a damaged tree will give a larger yield of gum. The axe is twisted and pulled back in such a way that two ends are formed and the strip of the bark is removed by pulling one strip up and the other strip down by leaving a thin layer of bark on xylem. If xylem is exposed, white ant enters the plant and gum is not produced. Thus, the natives will cut and strip the bark and branches from a tree and return later to collect the gum fromed in the wounds. The gum starts getting collected within 3 – 8 weeks depending upon the weather conditions. During summer the gum exudates after 3 – 4 weeks whilw in winter it takes little longer time of 6 – 8 weeks, this is believed to be so because in summer the bacteria find its way through the incision which make the exudation faster and harden on exposure to the atmosphere. During dry season (October – June) the gums are collected once in every 10 days. Gum is dried under the sun by keeping it in trays in thin layers for 3 weeks. This process bleaches the gum and it becomes whiter, cracks and fissures are developed on the outer surface. This process of converting the original gums into opaque gum is called 'ripened'.
Description:
Size: 1 to 4 cm in diameter
Shape: Spheroidal or oval tears or pieces.

Colour: White, yellow or pale amber. **Nature**: Opaque, brittle and breaks easily. **Odour**: Odourless. **Taste**: Mucilaginous

Solubility: soluble in water and insoluble in alcohol. **Optical activity**: Gum in water is slightly Levorotatory. **Chemical Constituents:**

It mainly consists of a high molecular weight glucosidal acid called as the Arabic acid. Arabin is a mixture of calcium, magnesium amd potassium salts of Arabic acid which is also present in the gum. Arabic acid on complete hydrolysis yield aldobionic acid, 3 molecules of L – arabinose, 2 molecules of L – galactose and 1 molecule of L – rhamnose. The main fractions which have been identified are: Arabinogalactan, Arabinogalactan – protein complex and Glycoprotein which is 1% of the molecule along with halg of the polypeptide fraction. Accacia also contain an oxidase ezyme and about 14% of water.

Chemical test:

1. A solution is prepared by adding 15 ml of water to 10 gm of the gum and stirred well. Use this solution for the following tests:

a) To 5 ml of the gum solution add 0.1 gm borax. A stiff transclusent mass is formed.

b) Dilute 1 ml of the gum solution by adding 2 ml of the water and then add few drops of lead subacetate solution to it. White, bulky precipitate is formed.

c) To 5 ml of the solution add few drops of 1% solution of benzidin in alcohol and hydrogen peroxide. Blue colour is produced, due to enzyme oxidase.

d) To 1 ml gum solution add 4 ml water and dilute HCl, then boil it for few minutes. Hydrolysis takes place and reducing sugars are produced. Add fehling's solution and heat; red precipitate of cuprous oxide is produced.

2. Dilute 1 ml of the solution by adding 10 ml water and keep it for rew hours. No sediment should be deposited.
3. To 1 ml of the solution add 4 ml of water and few drops of lead acetate solution. No precipitate should be produced.
4. To 1 ml of solution, add 4 ml of water, boil, cool and add 2 drops of N/10 iodine solution. Blue color is produced if starch is present and brown colour if dextrin is present.

To 1 ml of the solution add 4 ml of water and few drops of 0.1% ferric chloride solution. No blue or black colour should be produced. Blue or black colour indicates the presence of tannis which may be due to the presence of bark or wook in drug.

Uses:

It has demulcent property, so it is employed in various coughs, diarrhea and throat preparations, also used as emulsifying agents and suspending agents in pharmaceutical industry and as binding agent for pills and tablets. It is administered intravenously in haemolysis.

Allied drug:

Talka gum, it is usually broken and of variable compositions and also some tears will be brown in colour and othe colourless.

Anogeissus latifolia (Gum Ghatti or Indian gum) the guns from this plant is prepared very similar to acacia gum preparation, it shows intermediate viscosity between acacia and sterculia gum.

Gum combretum from *Combretum nigricans* is an adulterant of gum Arabic and is not used as food additive.

Substitutes and adulterants:

Gummifera is a dark coloured gum with few fissures. They occur as white fissured tears. The Indian acacia (*A. Arabica*) are gums wuth yellow to dark brown in colour, the cape or the A. Horrid and the *A. Dealbata* are even used in the industries. The East African gums like the Sennaar gum, the Gedaref gum, the Ghezireh gum, Somali gum are gums with inferior quality. All these gums form a ropy solution with water and on diluting it further it does not dissolve but swells in water. The inferior qualities of gum also consist of starch and tannins which can also be detected by the chemical tests.

INDIAN ACACIA:

Synonyms: Acacia, Gum acacia

Biological source: It is the dried gummy exudation obtained from the stem and branches of *Acacia arabica*

Fammily: Leguminosae

Geographical source: India, Sri Lanka, Africa

Description : Size: Varies Shape: Tear shape

Colour: Cream brown to red in colour

Taste: Tasteless

Odour: Odourless

Solubility: Soluble in water and Insoluble in alcohol

Chemical constituents:

The main constituent is arabin. Arabin is a mixture of calcium, magnesium amd potassium salts of Arabic acid. It also contains oxidase an enzyme.

Uses:

This gum shows excellent emulsitying properties, act as demulcent and a good binder

AGAR

Synonyms: Agaragar, *Japanese Isinglass*

Biological source: It is the dried gelatinous substance obtained by extraction with water from Gelidium amansii or various species of red algae like *Gracilaria* and *Pterocladia*.

Family: Gelidaceae (Gelidium & Pterocladia), Gracilariaceae (Gracilaria)

Geographical source:

Agar (*Japanese Isinglass*) is the dried colloidal concentrate from a decoction of various red algae, particularly species of *Gelidium, Pterocladia* (both Celidaceae, order Gelidiales), and *Gracilaria*

(Gracilariaceae order Gigartinales). Agar is obtained from Japan (*Geliditun amansii*), Korea, South Africa, both Atlantic and Pacific Coasts of the USA, Chile. Spain and Portugal.

Collection and preparation:

The red algae are grown in rocks in shallow water or on the bamboos by placing them in the ocean. Collection of the algae is usually made in summer (May and October). The bamboos are taken out and the seaweeds are stripped off. Algae are dreid, beaten with sticks and shaken to remove the sand and shell attached to them. Then the entire material is taken to high altitude, washed with water and bleached by keeping them in trays in the sunlight, sprinkling water and rotating them periodically. The agar is then boiled; one part of algae with 50 parts of water acidified with acetic acid or dilute sulphuric acid. The hot extract is subjected for coarse and fine filtration using cloth to remove the large and small impurities present in them. The filtered extract is then transferred into wooden trough which on cooling forms a jelly like mass. The mass thus obtained is then passed through screw press to obtain strips of agar. These strips contain water and to remove the water and to remove the water present in them, the agar strips are placed in open air to ger the benefits of the Japanese climate. During this season, japan has a very warm day and the nights are very cold with a temperature less than 0°C. As a result of this climate the water present on top of the strips are converted into ice at night and during day they are again dried in the sunlight in trays.

Modern method of deep freezing is being utilized in the preparation of agar in recent development of technology. The algae which is collected is washed in running water for a dya and then extracted firstly with diluted acid in steam – heated digester and then with water for 30 hr, the hot solution so obtained is cooled and deep freezed in an ice machine. The water present in the agar is converted to ice and these masses are powdered, melted and filtered in toraty vaccum filter. The moist agar is dried using dry air and the powdered agar is obtained.

Description:

Size: Sizes are about 60 cm in length and 4 mm wide. Wide sheets are 50 – 60 cm long and 10 -15 cm wide.

Shape: Strips, flakes or coarse powder.

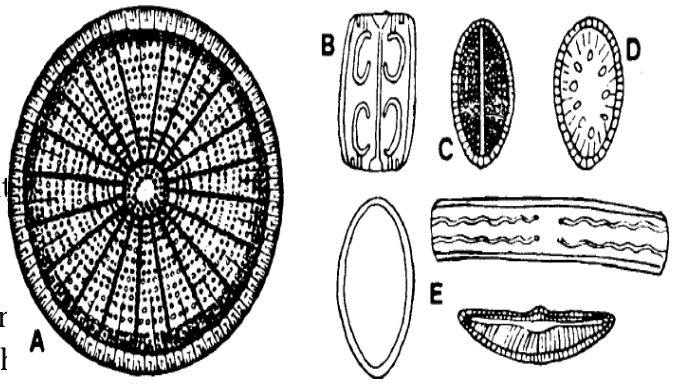
Taste: Mucilaginous

Colour: Yellowish white to grey or colourless.

Odour: Slight or odourless.

Solubility: Soluble in hot water.

Forms a gelatinous solution after cooling the hot solut



Chemical constituents:

Agar is a complex heterosaccharide and contains two different polysaccharides known as agarose and agar and is responsible for the gel property or agar. Agar l and L- galactose and sulphate ions. It is now known to be a heterogeneous polysaccharide the two principal constituents of which are agarose and agaropectin. Agarose is a neutral galactose polymer (free from sulphate) which is principally responsible for the gel strength of agar. It consists of

alternate residues of 3,6
–anhydro - L-galactose and – D – galactose (the disaccharide known as agarobiose). The structure of agaropectin, responsible for the viscosity of agar solutions is less well established but it appears to be a sulphonated polysaccharide in which galactose and uronic acid units are partly esterified with sulphuric acid. The structure of agaropectin is not completely known but it is believed that it consist sulphonated polysaccharide in which galactose and uronic acid are partly esterified with sulphonic acid. Agaropectin is responsible for the viscosity of agar solution.

Chemical tests:

1. Powdered drug when treated with ruthenium red gives red color.
2. 0.5 ml hydrochloride acid is added to 0.5ml aquous solution and heated on water bath for 30 minutes and divided into two parts:

i) Add to 1^{st} part 3 ml of 10% caustic soda solution and 2 ml Fehling's
ii) solution and heat on water
bath. Reduction takes place due to galactose.
iii) Add barium chloride solution to 2^{nd} part white precipitate of barium sulphate is obtained.

3. Add dilute HCl to incinerated ash and see in microscope, skeletons and sponge spicules or diatoms are seen.
4. As agar does not contain nitrogen the following test of gelatine are negative:

A	Heated with soda lime	No NH_3 produced
B	Millon's reagent	No ppts
C	0.2% soln. Of agar + tannic acid soln.	No ppts

Uses

Agar is used in the preparation of culture media as an emulsifying agent and in the treatment of chronic constipation. It's used in preparation of jellies and in other confectionary items.

Substitutes and adulterants:

Gelatin and Danish agar. The presence of gelatine can be detected by addition of equal volume of 1 % trinitrophenol and 1% of agar solution; the solution produces tubidity or precipitation. Danish agar has
an ash of 16.5 to 18.5 %, it is formed from rhodophyceae indigenous to the Denmark costal region. TheDanish agar has a gel strength which is half its gel strength of Japanese agar

TRAGACANTH

Synonyms: Gum tragacanth

Biological source: it is define as the air-hardened gummy exudate, flowing naturally or obtained by incision, from the trunk and branches of *Astragalus gummifer* and certain other species of *Astragalus* **Family**: Leguminosae

Geographical source: Iran, Turkey, Syria, USSR, Anatolia, etc. Tragacanth is also produce in India,

central Punjab, Kumaon are some areas where tragacanth is produced in India.

Collection:

The mode of formation is different from acacia, the acacia gum is produced slowly after making incision, where as the gum exudes immediately agrer an incision from Astragalus. Tragacanth is collected fro, two years old planggrowing at an altitude of 1000 – 3000 m. The gum collected before first year is of inferior quality. Vertical incision is made two inches above the soil and the gum is coolected in a wedge shaped piece of wood for 12 to 24 hours. The shape of the gum depends upon the type of incision, if the incisions are straight exudations are flat and rubbon shaped. If round, shape of the gum is vermiform. After making the incision some plants are burned at top for the exudation of more gum. Tragacanth obtained by this method will be of lower quality, reddish and dirty looking.

Description:

Colour: white, slight yellow coloured.

Odour: Odourless

Taste: Mucilaginous

Shape: Flat or curved ribbon shaped flakes

Size: Flakes are 3 cm. Long and 1 cm wide and 2 mm thick

Solubility: soluble in water and Insoluble alcohol. It is fairly soluble over a wide pH range as low as pH 2.

Chemical constituents:

Tragacanth consists of a water-soluble fraction known as tragacanthin and a water-insoluble fraction known as bassorin. Both are insoluble in alcohol. Tragacanthin and bassorin may be separated by ordinary filtration of extremely dilute mucilage. Tragacanthin constitutes about 30% of the gum. About 60 to 70% is bassorin, the water insoluble fraction containing methoxy groups and is responsible for the swelling and gelatinizing properties of the drug. Tragacanthin contains tragacanthic acid and a polysaccharide. Tragacanthic acid on hydrolysis yields galactouronic acid, xylose, fucose, and galactose. The polysaccharide arabinogalactose on hydrolysis yields arabinose and galactose.

Uses:

Tragacanth is used as demulcent, emollient in cosmetics, suspending agent for insoluble substance and binding agent in pills and tablets, as emulsifying agent for fixed oils, volatile oils and resins. Due to swelling properties it is used as bulk laxative and in confectionary.

Allied drugs:

Hog tragacanth is nonpharmaceutical grades or lower grades of tragacanth used in textile and pickle industries.

Sterculia gum could be used as an adulterant and its presence in tragacanth is detected by the gel formation in alcoholic aolution or acidity test.

Insoluble Shiaz gum from Iran could be differentiated from tragacanth by the absence of starch in them.

HONEY

Synonyms: Madhu, Mel

Biological source: Honey is a saccharine substance deposited by the hivebee, *Apis mellifera*, and other species of Apis, in the cells of the honeycomb.

Family: Apidae

Geographical source:

Honey is produced in England, but the chief sources of supply are the West Indies. California, Chile, various parts of Africa, Australia and New Zealand and also in India.

Collection and Preparation:

The worker bees by means of a long, hollow tube formed from the maxillae and labium, take nectar fiom the flowers they visit and pass it through the oesophagus into the honey sac or crop. The nectar, which consists largely of sucrose, is mixed with salivary secretion containing the enzyme invertase and while in the honey-sac is hydrolysed into invert sugar. On arrival at the hive the bee brings back the contents of the honey-sac and deposits them in a previously prepared cell of the honeycomb. Invert sugar present in the honey comb is converted into honey in the next three days and then water is lost by evaporation. At this stage honey contains about 80% invert sugar and 20% water. The best honey is that derived from flowers such as clover and heather, obtained from hives that have never swarmed, and separated from the cut comb either by draining or by means of a centrifuge. Honey obtained by expression is liable to be contatninated with the wax. The nectar of certain flowers (e.g. of species of *Eucalyptus* or *Banksia*) may give the honey a somewhat Unpleasant odour and taste.

Description:

Colour: White to pale yellow or yellow – brown

Nature: Viscid, transclucent liquid.

Odour: Pleasant and characteristic depends upon the flowers where the nectar is ontained.

Taste: Sweet

Optical Rotation: +3° to -10°

Total ash: 0.1 to 0.8%

Chemical Constituents:

Honey consists mainly of invert sugar and water. It contains small quantities of sucrose, dextrin, formic acid, volatile oil, wax and pollen grains. The most likely adulterants are artificial invert sugar, sucrose and commercial liquid glucose. The testst of purity of the BP purified honey should be noted. The limit tests tor chloride and sulphate are important, as starch and sucrose may he hydrolysed with acids to give commercial liquid glucose and artificial invert sugar, respectively. Artificial invert sugar contains furfural, which gives a red colour with resorcinol in hydrochlolic acid, but this may be formed in genuine honey by prolonged heating or lengthy storage.

Uses:

It is used as nutritive, sweetening agent, mild laxative, demulcent, antiseptic and it is also in the

preparation of oxymels, soft drinks and candies. It is chiefly used in pharmacy as a component of linctuses and xough mixtures.

Adulterant:

Artificial invert sugar: the hydrolysis of sucrose by mineral acids like HCl, but it contains furfural, which is abscent in natural honey and the presence of furfural can be detected by **Fiehe's test(**Furfural gives red colour with resorcinol in HCl).

STARCH

Synonym: Amylum

Biological sources: It consists of polysaccharide granules obtained from the grains of *Zea mays* (maize) or*Oryza sativa* (Rice), or *Triticum aestivum* (Wheat) or from *Solanum tuberosum* (Potato)

Family: Gramineae (Maize, Rice) or Solanaceae (Potato)

Starch constitutes the principal form of carbohydrate reserve in the green plant and is to be found especially in seeds and underground organs. The green parts of plants exposed to sunlight contain small granules of transitional starch which arise from photosynthesis. During the hours of darkness these are removed to the storage organs. Starch occurs in the form of granules (starch grains) the shape and size of which are characteristic of the species as is also the ratio of the content of the principal constituents, amylase and amylopectin.

Preparation of Starch:

Maize starch

The fruits are collected and washed thoroughly to remove dirt and adhering material. Then they macerated for 2 to 4 days with water containing 1% sulphurous acid at 40° to 60°. Fruits become sofr, and these fruits are crushed in rollers to separate the embryos containing fixed oil. The liquid remaining after the separation of the fruit consists of minerals, organic phosphorous proteins, carbohydrates, etc. The cornstreep liquor is used as culture medium for the production of penicillin. Germs are skimmed off by the addition of water into it and maize oil is prepared from it. The milky liquid resulting after the separation of the germ is filtered through sieves of very small mesh to separate the cell tissue and gluten. The cell tissue containing ccellulose is used as animal food. The milky liquid consisting of the impure starch along with protein is then subjected to the process of tabling operation. In this process liquid is poured slowly over shallow tables of about 40 meters long 20 – 30 cm. Deep and 30 – 60 cm broad. Starch being heavier gets deposited in the tables while protein falls on the sides. The traces of protein present along with the starch are then separated either by repeating the process of tabling operation or by treating with dilute alkali. The treatment with dilute alkali dissolves or swells the gluten, which are separated by filtration. The starch is then washed with water and dried. Successive centrifugation is now- a- days employed for the separation of protein from starch. Maize oil contains unsaturated fatty acids like: linoleic and linolenic acid that can be used in the manufacture of soap.

Rice starch:

It is prepared from broken pieces of rice which are left after the polishing of rice. Broken pieces of rice are macerated with 0.5% caustic soda solution to dissolve / swell the gluten. The rice pieces are separated and the milky starchy liquid kept aside for the settling down of the starch or they are separated by centrifugation. The starch is separated, washed, dried and powdered.

Wheat starch:

The wheat flour is taken and made into dough by adding water and kept for one hour for the swelling of glutens. Lumps or balls of the dough are made and put in grooved rillers moving to and fro and water is poured over simultaneously. The milky liquid falling down carries the starch along with it. This starch can be separated by centrifugation. The washed starch is dried and powdered.

Potato starch:

Potatoes are washed and cut into small pieces. Pulp is prepared by crushing it in rasping machine. Water is added and the solution filtered through sieve to separates the cellular tissue. The milky starchy liwuid is purified by centrifugation. The washed starch is dried and powdered

Description:

Starch occurs in sample or compoundgrains.

Colour: White powder or in irregular angular mass.

Solubility: Insoluble in cold water.

Specific gravity: 1.60 to 1.65, so heavier than water and it sinks in water.

Description of individual starch:

Maize starch: They occur in uniform size. The diameter of granules is usually from 10 to 15µ. Compound grains are found very rarely. Grains are angular, polyhedral and round. Hilum is distinct with two to five rayed cleft. Maize starch is natural or slightly alkaline. Strations are absent.

Rice starch: Large and small granules are present. Large granules of 10 to 45 µ in size are discoid or lenticular while small granules are rounded and 2 to 10µ in diameter. Hilum appears as a line and striations are faint. Compound granules are formed of 2 to 4 components. Wheat starches are slightly acidic.

Potato starch: It is composed of flattened ovoid or subspherical granules. Subspherical granules are of 10 to 35 µand ovoid granules 30 to 100µ in diameter. Striations are well marked. Compound granules are formed by 2 to 4 components. Potato starches are slightly acidic.

Chemical constituents:

It contains two different substances amylose and amylopectin. Amylose consists of straight – chained glucose units consisting of α 14 glucosidic bonds with high molecular weight and it's responsible for the soluble property of starch. Amylose undergoes hydrolysis with β amylase and yields maltose.

Amylopection consist of both straight as well as branched chains of glucose units. It has α 14 linked glucose units in straight chains and α 16 glucose units in branched chains. It is insoluble in water and swells with, water and it is responsible for the gelatinizing property of the starch, it gives bluishblack colour with iodine solution.

Uses:

It is nutritive, demulcent, protective and absorbent. It is used as an antidote in iodine poisoning and also as disintegrating agent in pills and tablets, dusting powder in swelling and inflammation. Starch is also used as a precursor for manufacturing dextrose, glucose and dextrin.

SODIUM ALGINATE

Synonyms: Algin, Alginates, Alginic acid, Sodium polymannuronate.

Biological source: It is the sodium salt of alginic acid. They are prepared from several of the larger family phaeophyceae. The most important species under this are laminaria species. (Laminariaceae) known as kelp, and Fucus species (Fucaceae) known as wracks. The common species of kelps are *Laminaria digitata*, *L. cloustoni, L. hyperborean and Macrocystis pyrifera* and the common species or wracks are *Ascophyllum nodosum, Focus serratus and F. vesiculosus.* Brown seaweeds are found on coasts of atlantic and pacific oceans. They are also found on coasts of Saurashtra in India. The brown colour of the algae is due to carotenoid pigment fucoxanthin, which masks other pigments.

Preparation:

Alginc acid is present in the cell wall. The dried seaweeds are washed with faintly acidulated water to remove salt content; dried and milled. The seaweed is further treated with sodium carbonate at a pH of 10 and the liquid is filtered. Calcium chloride solution is added to it for the preparation of calcium alginate. The precipitated calcium alginates are treated with HCl for the conversion of calcium alginates into alginic acid, the obtained alginic aci is neutralized using sodium carbonate and converted to sodium alginate.

Description:

Colour: White or slightly yellowish powder.

Taste: Tasteless

Odour: Odourless

Solubility: With water it forms visxous colloidal solution. It is insoluble in alcohol, ether and chloroform.

Chemical constituents:

Alginic acid is straight chained polyuronic acids composed of residues of D. mannouronic acid and L. guluronic acid.

Uses:

They are used as stabilizing, thickening, emulsifying, suspending, gelling and film and filament forming agents in pharmaceutical formulations and industries. It is used as binding and disintegrating agents in tablets. It is also usedin inflammation of skin, dental preparation and externally as haemostatic. It is employed in testiles, cosmetic and food industries, and in manufacturing of jellies and icecreams.

PECTIN

Biological sources: It is the purified carbohydrate product obtained by acid hydrolysis form inner portion of the citrus peel i.e. *Citrus limonum* or *Citrus aurantium*

Family: Rutaceae

Preparation:

There are various processes available for the isolation of pectin depending upon the source from which it is being isolated. The lemon or orange peel is heated with water at 90° for half an hour. The proportion of crude drug and water is 1:20 and acidic pH of about 3.6 – 4.0 should be maintained using acids like tartaric or lactic acids. The peels are pressed and the solution decanted or centrifuged. Impurities present in the solution can be removed by enzymatic hydeolysis and these enzymes are later deactivated by heating to a higher temperature. The pured pectin can be precipitated using organic solvents.

Description:

Colour: Cream or Yellowish coloured powder.

Odour: Oderless

Taste: Mucilaginous

Chemical Constituent:

It is a heterogeneous group of acidic structural polysaccharides. Pectins are polyuronoides and consist of mixtures of pectic substances like protopectin, pectin, pectinic acid and calcium pectate. Pectin has a complex structure. Commercial extraction causes extensive degradation of the neutral sugar – containing side chains. The majority of the structure consists of homopolymeric partially methylated poly – α – (1→4) – D – galacturonic acid residues but there are substaintial ' haity' non – gelling areas of alternating α – (1→2) – L – rhamnosy 1 – α – (1→4) – D – galacturonosyl sections containing branch points with mostly neutral side chains of mainly L – arabinose and D – galactose. Pectins may also contain rhamnogalacturonan II sidechains containing other residues such as D – xylose, L – fucose, D – glucuronic acid, D – apiose, 3 deoxy – D – manno – 2 octulosnic acid and 3 – deoxy – D – lyxo – 2 – heptulosonic acid attached to poly – α – (1→4) – D – galacturonic acid regions.

Chemical tests:

1. 10% aqueous solution forms a stiff gel on cooling.
2. To 5 ml of 1% solutions, add 1 ml of 2% solution of KOH and set a side at room temperature for 15 minutes. A transparent gel is formed which is acidified with dilute HCl and shaken well. A gelatinous precipitate formed which on boiling becomes white and flocculent.

Uses:

As an adsorbent in the treatment of diarrhea. As a hemostatic for both internal and external haemorrhages, as emulsifying agent and a plasma substitute. It is used as a thicknening agent for sauces, jams, letvhups in food industries. It is mainly used in cosmetic preparation.

It is more soluble in acidic medium. It is used in combination with gelatin as an encapsulating agent in pharmaceutical preparation to promote sustained release.

GUAR GUM

Synonyms: Guar flour, Jaguar gum, Guaran

Biological source: It is obtained from the endosperm of the seeds of

Cyamopsis tetragonolobus

Family: Leguminosae

Geographical source: India, Pakistan and U.S.A.

Preparation:

It is manufactured from the seeds. Using grinder the seeds are parted and separated in to husk and cotyledons. Cotyledons are separated from endosperm by winnowing. Further the endosperm in pulverized and grinded. The cotyledons adhered to the endosperms are separated by sifting and this process of grinding and sifting is carried out for 4 – 6 times. Finally it is sifted using sieve of 40 to 60 mesh size to get powdered guar gum.

Description:

Colour: colourless to pale yellow coloured powder.

Odour: Characteristic

Taste: Gummy

Swells with water and forms a translucent suspension

Chemical constituents:

It contains high molecular weight hydro colloid polysaccharide, Guaran. Guar gum consists of 60 – 65% mannose and 35% galactose. It also contain 5 – 7% of protein.

The principal constituent of the gum is a galactomannan which on hydrolysis gives galactose and mannose: these sugars of the hydrolysate constitute the basis of the pharmacopocial thin layer chromratography test for the drug. Other tests refer to the absence of other gums, viscosity, loss on drying, ash and microbial contamination. Fatty acids, both free and combined as esters.

Chemical tests:

1. With weak solution of iodine and solution of rhuthenium red it does not acquire olive green and red colour respectively.

Solution of guar gum precipitates with 2% lead acetate solution

Uses:

Used in pharmaceutical as a thickening agent, binder and disintegrating agent for tablet. Also used as hypoglycaemic, hypocholestremic, appetite depressant, bulk laxative and in treatment of peptic ulcer. It is largely used in textiles, printing, polishing, food processing, cosmetics and paper industries.

Guar is available as an oral hypoglycaemic drug:

It produces changes in gastric emptying and in the gastrointestinal transition time, which can delay absorption of sugars and oligosaccharides from the gut. Guar also lowers cholesterol levels. Possibly by binding bile salts in the gut. However, its efficacy in the treatment of diabetes is not considered by all to be fully proven. The gum, with 5-6 times the thickening power of starch, is also used in the food industry.

Proteins

Proteins are large peptides. A protein is made up of one or more polypeptide chains, each of which consists of amino acids. Proteins, long polymers of amino acids, constitute the largest fraction (besides water) of cells. Some proteins have catalytic activity and function as enzymes; others serve as structural elements, signal receptors, or transporters that carry specific substances into or out of cells. Proteins are perhaps the most versatile of all biomolecules.

Dietary proteins are the primary source of essential amino acids (or nitrogen). Digestion of dietary proteins produces amino acids, which are absorbed through epithelial cells and enter the blood. Various cells take up these amino acids that enter the cellular pools. In our bodies, amino acids are used for the synthesis of proteins and other nitrogen-containing compounds, or they are oxidized to produce energy. Cellular proteins, hormones (thyroxine, epinephrine and insulin), neurotransmitters, creatine phosphate, the haem of haemoglobin, cytochrome, melanin (skin pigment) and nucleic acid bases (purine and pyrimidine) are examples of amino-acid-derived nitrogen-containing biologically important group of compounds found in humans.

Gelatin

Gelatin is a translucent, colorless, brittle (when dry), flavorless food ingredient that is derived from collagen obtained from various animal body parts.

Hydrolyzed collagen is produced from collagen found in the bones, skin, and connective tissue of animals. The process of hydrolysis involves breaking down the molecular bonds between individual collagen strands and peptides using combinations of physical, chemical or biological means. Gelatin is an irreversibly hydrolyzed form of collagen, wherein the hydrolysis results in the reduction of protein fibrils into smaller peptides, which will have broad molecular weight ranges associated with physical and chemical methods of denaturation, based on the process of hydrolysis.

It is commonly used as a gelling agent in food, medications, drug and vitamin capsules, photographic films and papers, and cosmetics.

Casein

Casein is a family of related phosphoproteins (αS1, αS2, β, κ). These proteins are commonly found in mammalian milk, comprising 80% of the proteins in cow's milk and between 20% and 45% of the proteins in human milk. The most common form of casein is sodium caseinate.

Casein contains a high number of proline residues, which do not interact. There are also no disulfide bridges. As a result, it has relatively little tertiary structure. It is relatively hydrophobic, making it poorly soluble in water. It is found in milk as a suspension of particles, called casein micelles, which show only limited resemblance with surfactant-type micelles in a sense that the hydrophilic parts reside at the surface and they are spherical.

Casein has a wide variety of uses, from being a major component of cheese, to use as a food additive.

Enzymes

Enzymes are proteins which catalyses many reaction taking place biological reactions. They play a vital role in the function of cells and activities of an organism. They are also known as biological catalysts. The enzymes are of wide distribution and are specific in their action an enzyme usually acts on the one subs or class of subs.

The enzymes show means activity between 35 to 40°C and beyond 65°C gets denaturated. Although they are soluble in water and all alcohol, concentrated alcohol ppts them. The function like pH of medium has direct effect on their action. An enzymatic activity is reduced by formaldehyde, free iodine and heavy metals of tannins. The property of enzymes which makem them exceptional catalysts are as under:

1. They catalyst only a specific range reaction and in many cases only one reaction is catalyse by a given enzyme.
2. Some of them have low degree of specificity like pepsin, which hydrolyses almost all soluble native proteins, so, specificity is one of the most important Characters of enzymes.
3. As a group they are exceptionally versatile catalyst. They effectively catalyses hydrolytic reaction dehydration, oxidation, reduction reaction: acyl transfer reaction etc.
4. They are exceedingly efficient under optimal condition. Most of the enzymatic reaction proceeds 8-10 times more rapidly than the corresponding non-enzymatic reaction.

The enzymes are classified into following categories:

1. Hydrolyses: for catalysis of hydrolytic reac.
2. Transferases: for the transfer of chemical group from one molecule to another
3. Oxido-reductase: catalyes the oxi-red reaction
4. lyses: catalyse the addition of group to double bonds or vice versa
5. synthetases :catalyse the condensation of two molecules coupled with the cleavange of pyrophosphate bond of ATP or similar triphosphate
6. Isomerase : it helps for intra molecular rearrangements

Further on the basis of site of action enzymes can be grouped as under

1) Endo enzymes: those which act only inside the cell are known as endoenzymes. These involve in the synthesis of cell components, food recovers & bioenergetics. Involved are also intracellular ex. Are synthetases, isomerases and phosphorylase.
2) Exoenzymes : these enzymes which are secreted outside the cell are known as exoenzymes or extracellular enzymes . These are normally digenrative in their functions. They hydrolyse very complex molecular into simple comps. i.e. proteoses, lipase , amylases, acting on protein,lipid or starch respectively .
3) Apo enzymes: he enzymes prossess non-protein chemical groups. An enzymes moiety comprises of a protein component “apoenzymes “ & a prosthetic group representing non –protein components. The latter is als called COFACTRO or COENYME Eg. Certain metals & vitamins

Papain

Synonyms : papayotin

Biological source : it is a mixture of proteolytic enzymes derived from the latese of unripe fruit of tropical melom tree ,carica papaya

F: caricaceae

Papain can digest 35 times its own wt. of egg albumin.

Chemical nature:

Diff proteolytic enzymes present in the mix. Oil papain&chymopapain,peptidase-1,renin enzyme, Amylolytic pectase enzyme.

Preparation: for processing of papain ,the latex of these fruits is collected in aluminium trays,to the collected latex,potassium metabisulphite is added

The extraneous matter is cleared out by passing fthrshelough sieves &latex is dried in vaccum shelf drier at 55-60c

It is also processed by spray drying,dried latex called papain.

Preparation:shallow incisions are given on the full grown ,green unripe fruit on the four sides .milky juice comes out freely for a few seconds but soon coagulous incisions & collection of latex is done at weekly inteds till the fruit exudes latex

The collected coagulated latexis shredded dried under oven to yield crude papain.

Crude papain purified by dissolving in water & ppting with alcohol.

Isolation of proteolytic activity based on action of crystalline papain is best at PH5-8 from dried latex.

Uses:

Clarification of beverages & as a meat tenderifer

In cheese mfg.as substitute of rennin degumming of silk fabrics in textile industry & in leather industry for dehairing of skins & hides

Medicinaly as anti-inflammatory agent-ointment

Reliving sympotoms of episitomy

Digestant for proteins

In treatment of contact lenses to prolong wwearing time

In keratolytic patients with papillary conjunctivitis.

Bromelain

Bromelain is an enzyme extract derived from the stems of pineapples, although it exists in all parts of the fresh plant and fruit.

Preparation

Produced mainly in parts of the world where pineapples are grown, such as Thailand or Malaysia, bromelain is extracted from the peel, stem, leaves or waste of the pineapple plant after processing the fruit for juice or other purposes. The starting material is blended and pressed through a filter to

obtain a supernatant liquid containing the soluble bromelain enzyme. Further processing includes purification and concentration of the enzyme.

Constituents

Bromelain extract is a mixture of protein-digesting (proteolytic) enzymes and several other substances in smaller quantities. The proteolytic enzymes are sulfhydryl proteases; a free sulfhydryl group of a cysteine amino acid side chain is required for function.

Uses

Bromelain is used for reducing swelling (inflammation), especially of the nose and sinuses, after surgery or injury.

Serratiopeptidase

Serratiopeptidase (Serratia E-15 protease, also known as serralysin) is a proteolytic enzyme (protease) produced by non-pathogenic enterobacterium Serratia species.

Serratiopeptidase is present in the silkworm intestine and allows the emerging moth to dissolve its cocoon. Serratiopeptase is produced by purification from culture of Serratia E-15 bacteria.

This enzyme is absorbed through the intestines and transported directly into the bloodstream. Serratiopeptidase enzyme has fibrinolytic, anti-edemic and anti-inflammatory activity. It is used to combat various kinds of inflammation and inflammatory disorders. It is reduce inflammation by thinning the fluids formed from injury, and facilitating the fluid's drainage.

Urokinase

Urokinase, also known as urokinase-type plasminogen activator (uPA), is a serine protease present in humans and other animals. Urokinase was originally isolated from human urine, and it is also present in the blood and in the extracellular matrix of many tissues. The primary physiological substrate of this enzyme is plasminogen, which is an inactive form (zymogen) of the serine protease plasmin. Activation of plasmin triggers a proteolytic cascade that, depending on the physiological environment, participates in thrombolysis or extracellular matrix degradation. Urokinase is effective for the restoration of flow to intravenous catheters blocked by clotted blood or fibrin (catheter clearance). Urokinase is a thrombolytic (THROM-bo-LIT-ik) drug, sometimes called a "clot-busting" drug. It helps your body produce a substance that dissolves unwanted blood clots. Urokinase is used to treat blood clots in the lungs.

Streptokinase

Streptokinase (SK) is a thrombolytic medication and enzyme. As a medication it is used to break down clots in some cases of myocardial infarction (heart attack), pulmonary embolism, and arterial thromboembolism. As streptokinase is a bacterial product, the body has the ability to build up immunity to it. Therefore, it is recommended that this medication should not be used again after four days from the first administration, as it may not be as effective and can also cause an allergic reaction. For this reason, it is usually given only for a person's first heart attack. Further thrombotic

events could be treated with Tissue plasminogen activator (tPA). Overdose of streptokinase or tPA can be treated with aminocaproic acid.

PEPSIN

It is substances ctg. proteolytic enzyme & is present in gastric juices of animals.

B.S.: It Is Obtained From Glandular Layer Of Fresh Stomach Of Hog ***Sus Scrofa*** Var Domesticus

Family: Suidae

Description: Col:Light Buff Or White Amorphous Powder Occurs In Translucent

Taste:Little Acidic Or Saline

Preparation:

The mucous linings of the stomach is either stripped off & minced or if scraped off the pulp is placed in water acidulated with HCL & is kept at the body temp.37 until autolysis has takes place.about 2 hr giving a clear liquid ctg.pepsin & peptones formed from the mucous tissue.

The liquid is filtered & Nacl or ammonium sulphate is added until the liquid is about half saturated with the salt when the pepsin is ppted while peptone remain in solution.

The ppt is collected suspended in water in dialyzer & salt removed by dialysis.

The aq. Sol of pepsin remain is ppt by adding alcohol the ppted pepsin is collected & dried at a law temp.

The sol in dialyzer may be evap. In vacuo at temp below 45c & the residue powdered.

It is bobtained in scales by evap.a strong solution to which 50 ml dextrin has been added painting the syrupy

Fluid on glass plates & drying.

Uses:

-protein lysis

-prep.of cheese

-dispepsia

Deficiency of gastric secretion

Lipids

Lipids may be defined as organic esters of fatty acids and organic alcohols. They are relatively insoluble in water but soluble in organic solvents and utilized by the living cells. Lipids (Fixed oils, fats and waxes) are all non-polar in nature and can be extracted efficiently using solvents such as light petroleum and hexane.

Classification

1. **Simple lipids:** They are the esters of fatty acids with alcohol. E.g. fixed oils

2. **Compound or complex lipids:** complex lipids are esters of fatty acids with alcohol containing additional groups like phosphate, nitrogenous base, carbohydrate, protein. E.g. phospholipids, glycolipids, lipoproteins
3. **Derived products:** they are hydrolytic products of lipids, which possess the characteristics of lipids and other lipid like compounds. E.g. sterols, carotenoids, essential oils.

Waxes

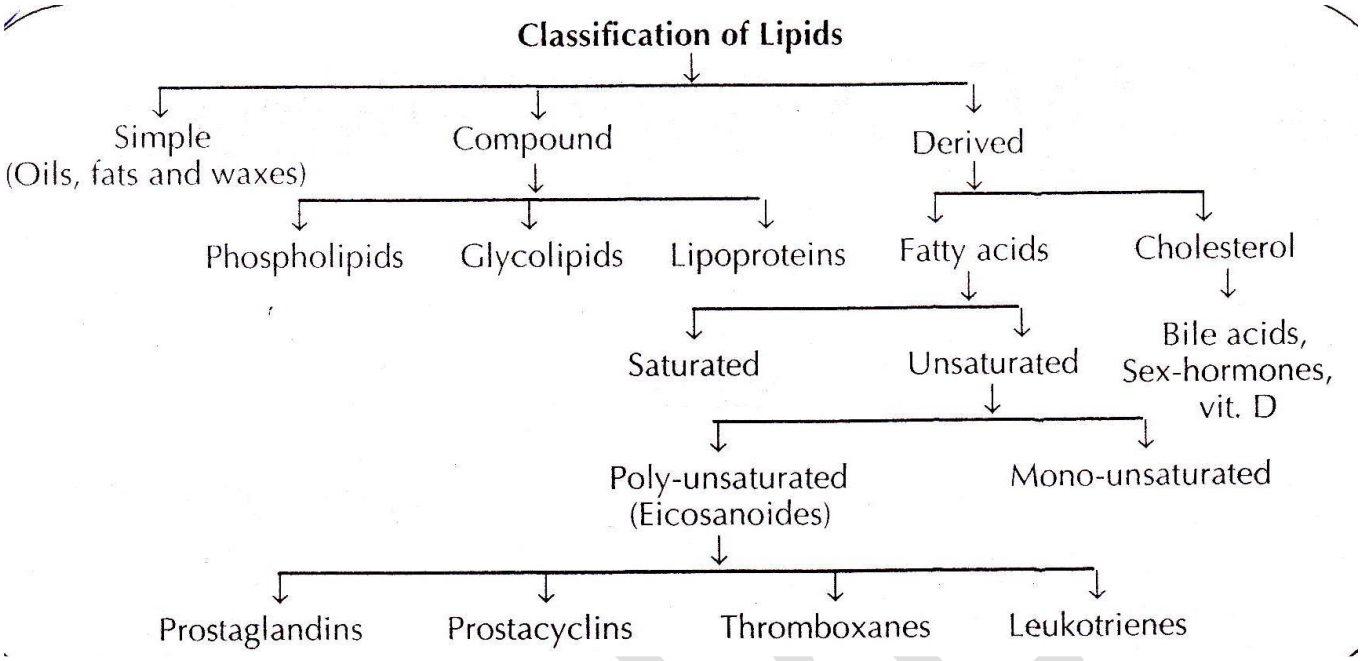
Waxes consist of a heterogeneous mixture of fatty acids, long-chain alcohols, esters of the two and paraffins. Waxes are unctuous, fusible, variably viscous solid substances, with characteristic waxy lustre. These are esters of fatty acids with high weight monohydric alcohol, such as cholesterol, cetyl alcohol, melissyl alcohol, etc. They are insoluble in water, but soluble in most organic solvents. The esters in waxes are generally more resistant to saponification than the glycerides of oils and fats. They are obtained from vegetable and animal sources.

(a) Vegetable - Seasal wax, carnauba wax, Japan wax, and bayberry wax
(b) Animal - Spermaceti, bees wax, wool fat

The difference between fats and waxes is that fats may be saponified by either aqueous or alcoholic alkali, but waxes are only saponified by alcoholic alkali. Waxes are unsuitable for internal consumption since there is no enzyme in human body to hydrolyse them internally.

Fixed oils, fats and waxes are all non-polar in nature and can be extracted efficiently using solvents such as light petroleum and hexane. They may also dissolve in chloroform, ethanol or methanol but these solvents will also extract out other types of phytochemicals. On industrial scale, these substances may be obtained by the process of expression (In expression, involves applying pressure to the material, which disrupts the cellular structure and allows the oil to flow out of the material).

NIPER



Castor oil

Synonyms

Ricinus oil, Oleum Ricini

Biological source

It is a fixed oil obtained by cold expression of the seeds of Ricinus communis belonging into family Euphorbiaceae.

Chemical constituents

Castor seeds contain about 50% fixed oil such as ricinoleic acid, linoleic acid, palmitic acid, stearic acid, dihydroxy stearic acid and 26% proteins. It contains ricin, a very poisonous protein and ricinin, a crystalline alkaloid. They are rich in phosphorus content which is present in the form of phytin. Ripe seeds contain several enzymes in small quantity like lipase, invertase and maltase.

Chemical tests

Castor oil is soluble in alcohol in all proportions. (distinct from other fixed oils.

5ml of light petroleum ether with 10ml of castor oil at 15.5°C shows a clear solution. If light petroleum ether is increased to 15ml, the mixture becomes turbid.

Uses

1. Castor oil is mild cathartic and purgative.
2. Ricinoleic acid is used in vaginal jellies for restoration and maintainance of vaginal acidity.

3. Castor oil is used in cosmetic product like hair conditioning, hair stimulant and moisturizing principles.
4. Castor oil is used as a lubricating agent, as it does not freeze at lower temperature and plasticizer.
5. Sulphated hydrogenated castor oil is used as water absorbent ointment and cream.

Allied drugs

1. Croton seeds (Croton tiglium, Euphorbiaceae) is resemble castor seeds in size and shape but has a dull, cinnamon brown colour.
2. Purging nuts (Jatropha curcas, Euphorbiaceae) is resemble castor seeds but are dull black and surface is minutely rugose with small white patches.
3. Abrus seeds (Abrus precatorius, Leguminosae) is red and black colored.
4. Castor oil is adulterated with rosin oil, blown oil and other untreated oil, groundnut, coconut, sesame, cotton seed, poppy seed oils and lard.

Chaulmoogra oil

Synonyms

Hydnocarpus oil, Gynocardia oil

Biological source

Hydnocarpus oil is the fixed oil obtained by cold expression method from ripe seeds of the plant Taraktogenos Kurzii and Hydnocarpus anthelmintic, Hydnocarpus heterophylla and other species of the Hydnocarpus belonging into family Flacourtriaceae.

Chemical constituents

Chemically, it contains esters of unsaturated fatty acids of chaulmoogric acid and hydnocarpic acid and glycerides of palmitic acid. It also contains glyceryl esters of chaulmoogric acid and glyceryl esters o-hydrocarpic acid.

Uses

The unsaturated fatty acids of chaulmoogra oil possess strong bactericidal effect, against Mycobacterium leprae and M. tuberculosis. It is found to be useful in the treatment of psoriasis and rheumatism. It is intended only for external use.

Substitutes

The plant is substituted in India by Hydnocarpus wightiana found abundantly in West Bengal, Kerala and Western ghats and also by Hydnocarpus alpine occurring in Karnataka, Kerala and Tamil Nadu.

Wool fat

Hydrous wool fat

Synonyms
Lanolin, adeps lanue

Biological source
Hydrous wool fat is the purified fat like substance obtained from the wool of the sheep *Ovis aries* belonging into family Bovidae. It is the secretion of sebaceous glands of sheep deposited into the wool fibres.

Geographical source
Commercially, lanolin is manufactured in Australia, U.S.A. and to a very less extent in India.

Method of Preparation
Raw wool contains about 31% wool fibres, suint or wool sweat (chemically potassium salts of fatty acids), about 32% earthy matter and about 25% wool grease or crude-lanolin. Crude lanolin is separated by washing with sulphuric acid or suitable organic solvent or soap solution. It is further purified and bleached. The product is known as anhydrous lanolin or wool fat. The hydrous wool fat is produced by intimately mixing wool fat with 30% of water.

Morphology
Colour: pale yellow, unctuous substance
Odour: faint and characteristic.
Extra features
On heating, it separates at first into two layers; with continued heating with stirring, water is driven off and the residue which is transparent while warm cools to form a yellowish, tenacious, soft mass.

Chemical constituents
Hydrous Wool Fat is a mixture of 75 % w/w of Wool Fat and 25 % w/w of Purified Water. It contains complex mixture of esters and polyesters of 33 high molecular weight alcohols and 36 fatty acids. Hydrous wool fat contains mainly esters of cholesterol and isocholesterol with caranubic, oleic, myristic, palmitic, lanoceric and lanopalmitic acids.

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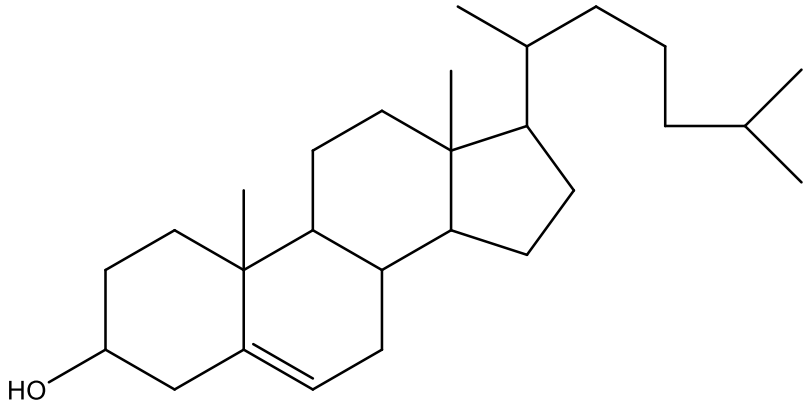

Cholesterol

Identification test

1. To a solution of 0.5 g of sample in 5 ml of *chloroform* add 1 ml of *acetic anhydride* and 0.1 ml of *sulphuric acid*; a green colour develops due to presence of cholesterol.
2. To a solution of 50 mg in 5 ml of *chloroform* add 5 ml of *sulphuric acid* and shake; a red colour is produced and a strong fluorescence appears in the lower layer.

Uses

The lanolin is mainly used as water absorbable ointment base. It is a common ingredient and base for several water soluble creams and cosmetic preparations. It can be allergic also.

Anhydrous wool fat

Synonyms

Anhydrous lanolin

Biological source

Anhydrous wool fat is the purified fat like substance obtained from the wool of the sheep *Ovis aries* belonging into family Bovidae.

Morphology

Colour: Pale yellow, unctuous substance

Odour: characteristic

Chemical constituents

It may contain Butylated Hydroxytoluene as an antioxidant.

Identification test

To a solution of 0.5 g of sample in 5 ml of *chloroform* add 1 ml of *acetic anhydride* and 0.1 ml of *sulphuric acid*; a green colour develops.

To a solution of 50 mg in 5 ml of *chloroform* add 5 ml of *sulphuric acid* and shake; a red colour is produced and a strong fluorescence appears in the lower layer.

Bees Wax

Biological source

Bees wax is purified wax obtained from the honey comb of the bees Apis mellifera and other species of Apis, belonging to family Apidae.

Character

It is yellow to yellowish-brown, and odor is agreeable and honey like. Bees wax is non-crystalline solid. It is soft to touch and crumbles under the pressure of fingers to plastic mass. Under molten condition, it can be given any desired shape. It breaks with a granular fracture.

Chemical constituents

It consists of esters of straight chain monohydric alcohols with straight chain acids. The chief constituent of the bees wax is myricin.

Uses

Beer-wax is used in preparation of ointment, plants and polishes. It is also used in cosmetics for preparation of lip-sticks and face cream.

Marine source

Crude drugs are obtained from sea or marine organisms are known as marine drugs. Marine Pharmacognosy is a sub-branch of Pharmacognosy, which is mainly concerned with the naturally occurring substances of medicinal value from marine. The 139 million square miles of sea water that covers 71% of our earth area and contain over 200,000 invertebrates and algal species and giving us important elements, food, raw materials and some useful drugs. Marine organisms has tremendous source of new molecular entity. This has led to the isolation of substances possessing antimicrobial, antiviral, anticancer, cardioactive, anti-inflammatory, anthelmintic and anticoagulant, neurophysiological and insecticidal activities. Marine invertebrates (particularly sponges, bryozoans, tunicates and ascidians) and marine actinomycetes are the sources of novel, bioactive secondary metabolites.

Various drugs obtained from marine sources

(1)Anti-cancer drugs Bryostatin Dolastatins Ara-C Ara-A	**(6)Antiviral compounds** Ara-A Avarol and Avarone Didemnins
(2)Anti-microbial drugs Cephalosporins Istamycins	**(7)Anti-inflammatory agents** Pseudopterosins Marine bi-indole
(3)Anticoagulants	**(8)Antiparasitic compound or Anthelmentic**

Carrageenan Laminarin	Kainic acid Domoic acid
(4)Miscellaneous agent 1. Protamine 2. Pralidoxime 3. Cod liver oil and shark liver oil	**(9)Pharmaceutical aids** Sodium alginate Agar Spermaceti Chitin
(5)Proteins Lectins	

Biochemicals produced by marine organisms, are very different than those from related terrestrial organisms and thus offer great potential as new classes of medicines. In western medicine agar, alginic acid, carrageenan, protamine sulphate, spermaceti and cod and halibut liver oils are the marine medicinal established products. Therefore, marine natural products will play a major role in drug discovery in the future. When compared to land plants and animals, the use of marine organisms in traditional medicine is very low. Last 40 years, marine organisms as sources of biologically active compounds have been confined. The chapter deals with the bioactive metabolites of marine algae, bacteria and fungi.

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