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PHARMACOGNOSY AND PHYTOCHEMISTRY - I

UNIT 5

TOPIC :

- **Carbohydrates** : Acacia, Agar, Tragacanth, Honey



Carbohydrates

Carbohydrates are organic compounds composed of carbon (C), hydrogen (H), and oxygen (O), usually in the general formula $C_x(H_2O)_y$. They are a major source of energy for living organisms.

Classification of Carbohydrates:

1. Monosaccharides

- Single sugar units (simple sugars).
- Examples: **Glucose, Fructose.**

2. Disaccharides

- Formed by the linkage of two monosaccharides.
- Examples:
 - **Sucrose** (Glucose + Fructose)
 - **Lactose** (Glucose + Galactose)

3. Oligosaccharides

- Composed of 3-10 monosaccharide units.
- Example: **Raffinose**

4. Polysaccharides

- Long chains of monosaccharide units.
- Examples: **Starch, Cellulose, Glycogen**

Acacia (Gum Acacia / Gum Arabic)

Biological Source:

- **Scientific Name:** *Acacia senegal* Willd. or other species of *Acacia*
- **Family:** Fabaceae (Leguminosae)
- **Part Used:** Dried gummy exudate obtained from the stems and branches

Preparation:

1. Collection:

- Gum is obtained by making incisions in the bark of Acacia trees.
- The exudate dries naturally as tears or nodules.

2. Purification:

- Collected gum is cleaned to remove bark and debris.
- It can be powdered or processed into a uniform product.
- Sometimes dissolved in water, filtered, and spray-dried to produce a purified form.

Evaluation:

1. Organoleptic Properties:

- **Color:** Pale yellow to amber
- **Odor:** Characteristic
- **Taste:** Bland and mucilaginous

2. Physical Tests:

- **Solubility:** Soluble in water; insoluble in alcohol
- **Viscosity:** Forms a viscous solution in water

3. Chemical Tests:

- **Identification:** With lead acetate solution, forms a white precipitate
- **Absence of Starch:** No blue color with iodine solution

Storage:

- Store in a cool, dry place in airtight containers to prevent moisture absorption and microbial growth.
- Protect from heat and direct sunlight to avoid degradation.

Therapeutic and Pharmaceutical Uses:

- **Demulcent:** Soothes irritated mucous membranes (used in lozenges and cough syrups)
- **Emulsifying Agent:** Stabilizes emulsions in pharmaceutical formulations
- **Suspending Agent:** Helps in uniform dispersion of insoluble drugs in liquid formulations
- **Binder:** Used in tablet formulations
- **Dietary Fiber:** Acts as a prebiotic promoting gut health

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Agar (Agar-Agar / Gellan Gum)

Biological Source:

- **Scientific Name:** *Gelidium* spp., *Gracilaria* spp. (Red algae)
- **Family:** Gelidiaceae / Gracilariacae
- **Part Used:** Dried, processed algae (thallus)

Preparation / Collection:

1. Collection:

- Algae are collected from marine environments, washed thoroughly to remove salts, sand, and epiphytes.

2. Extraction:

- The cleaned algae are boiled in water, which extracts the gelatinous polysaccharides.
- The extract is filtered, cooled to form a gel, and then dried to obtain agar in sheets, flakes, or powder.

Evaluation:

1. Organoleptic Properties:

- **Color:** White, pale yellow, or brown (depending on processing)
- **Odor:** Odorless or slightly seaweed-like
- **Taste:** Tasteless

2. Physical Tests:

- **Solubility:** Soluble in hot water; insoluble in alcohol
- **Gel Formation:** Forms a strong, reversible gel upon cooling
- **Viscosity:** Forms viscous solutions when heated in water

3. Chemical Tests:

- Forms a gel in water that does not melt below ~85°C
- Usually tested for purity by absence of foreign matter and microbial contamination

Storage:

- Store in a cool, dry place in airtight containers to prevent moisture absorption
- Protect from heat, light, and humidity

Therapeutic and Pharmaceutical Uses:

- **Laxative:** Softens stool and increases bowel movements
- **Bulk-forming Agent:** In dietary fibers and digestive health products
- **Suspending Agent / Gelling Agent:** Used in pharmaceutical formulations (ointments, jellies, and suppositories)
- **Microbiological Media:** Major component in culture media for microbiological studies
- **Stabilizer:** In food and pharmaceutical preparations for texture and consistency



Tragacanth (Tragacanth Gum)

Biological Source:

- **Scientific Name:** *Astragalus gummifer, A. microcephalus, A. brachycalyx*
- **Family:** Fabaceae (Leguminosae)
- **Part Used:** Dried exudate (gum) obtained from the stems and roots

Preparation / Collection:

1. Collection:

- Gum is obtained by making incisions in the stems and roots of the plant.
- The exudate dries naturally into flakes, tears, or nodules.

2. Purification:

- Collected gum is cleaned to remove bark, dirt, and other impurities.
- Sometimes, it is powdered **or** dissolved in water, filtered, and spray-dried to obtain a purified product.

Evaluation:

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1. Organoleptic Properties:

- **Color:** White, cream, or yellowish
- **Odor:** Odorless
- **Taste:** Bland, mucilaginous

2. Physical Tests:

- **Solubility:** Soluble in water (forms a viscous colloidal solution), insoluble in alcohol
- **Viscosity:** Forms highly viscous gels or mucilages

3. Chemical Tests:

- Forms a mucilaginous solution in water
- Tested for absence of starch and other foreign matter

Storage:

- Store in a cool, dry place in airtight containers to prevent moisture absorption and microbial contamination
- Protect from heat and sunlight

Therapeutic and Pharmaceutical Uses:

- **Demulcent:** Soothes irritated mucous membranes (used in lozenges and cough syrups)
- **Suspending Agent:** Helps in uniform dispersion of insoluble drugs in liquid formulations
- **Emulsifying Agent:** Stabilizes emulsions in pharmaceuticals
- **Binder / Tablet Excipient:** Used in tablet and capsule formulations
- **Dietary Fiber:** Acts as a prebiotic and aids digestion



Honey

Biological Source:

- **Origin:** Produced by honeybees (*Apis mellifera*) from nectar of flowers.
- **Family:** Apidae
- **Part Used:** Mature honey collected from honeycomb of bees.

Collection / Preparation:

1. Collection:

- Honey is harvested from the honeycombs after bees convert nectar into honey.
- Extraction is done by crushing, pressing, or centrifugation.

2. Purification / Processing:

- Filtered to remove wax, bee parts, and debris.
- Can be pasteurized or heated gently to prevent fermentation and prolong shelf life.
- Sometimes diluted with sugar syrup (adulteration must be checked).

Evaluation:

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1. Organoleptic Properties:

- **Color:** Pale yellow to dark amber
- **Odor:** Characteristic, sweet
- **Taste:** Sweet, slightly acidic

2. Physical Tests:

- **Solubility:** Soluble in water
- **Viscosity:** Viscous liquid
- **Specific Gravity:** Typically 1.38 at 20°C
- **pH:** 3.2-4.5 (acidic)

3. Chemical Tests:

- **Sugar Content:** Mainly glucose (30-40%) and fructose (35-45%)
- **Moisture Content:** <20% to prevent fermentation

- **Detection of Adulteration:** Using Fehling's test, polarimetry, or HPLC

Storage:

- Store in a cool, dry place in airtight containers
- Protect from moisture, heat, and sunlight to prevent fermentation and crystallization

Therapeutic and Pharmaceutical Uses:

- **Demulcent:** Soothes sore throat and irritated mucous membranes
- **Cough Suppressant:** Used in syrups and lozenges
- **Wound Healing:** Promotes healing due to antibacterial properties
- **Energy Source:** Provides immediate energy due to simple sugars
- **Excipient / Sweetening Agent:** Used in syrups, tonics, and oral formulations

