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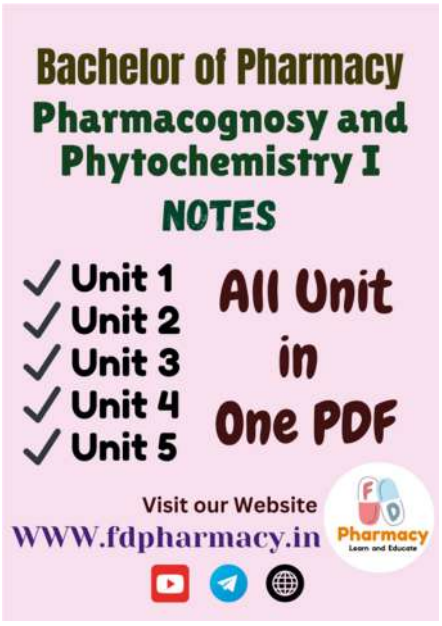
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PHARMACOGNOSY AND PHYTOCHEMISTRY – I

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 $\mathbf{C_x(H_2O)_\gamma}$. 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

Agar (Agar-Agar / Gellan Gum)

Biological Source:

- **Scientific Name:** *Gelidium* spp., *Gracilaria* spp. (Red algae)
- **Family:** Gelidiaceae / Gracilariaceae
- **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:

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:

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