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PHARMACOGNOSY AND PHYTOCHEMISTRY – I

UNIT 5

TOPIC :

- **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

Fibers

Fibers are long, thin, flexible, thread-like structures.

- Made from natural or synthetic materials.
- Mainly used to make fabrics, ropes, papers, and other industrial or medicinal products.

Classification of Fibers

A. Natural Fibers

- Obtained from plants or animals.
- **Examples:** Cotton, Jute, Hemp (plant fibers), Silk, Wool (animal fibers).

B. Synthetic Fibers

- Chemically synthesized fibers.
- **Examples:** Nylon, Polyester, Acrylic.

Uses of Fibers

1. **Clothing** – Used to make shirts, pants, dresses, etc.
2. **Home textiles** – Bedsheets, curtains, towels.
3. **Ropes and nets** – For fishing, climbing, and tying things.
4. **Bags and sacks** – Jute, cotton, and synthetic fibers used in making bags.
5. **Carpets and mats** – Made from wool, nylon, or coir fibers.
6. **Medical use** – Stitches (sutures), bandages, masks.

Cotton

Biological Source

- Cotton is obtained from epidermal hairs (seed hairs) of the seeds of the plant.
- **Genus:** *Gossypium*
- **Family:** Malvaceae
- **Common Species:**
  - *Gossypium hirsutum*
  - *Gossypium barbadense*
  - *Gossypium arboreum*

Chemical Nature

- Cotton is composed mainly of cellulose (90–95%).
  - Cellulose: A polysaccharide made up of glucose units.
- Also contains small amounts of wax, proteins, and pectins.

Uses

1. **Textile Industry:**
   - Manufacturing of clothes, bed sheets, towels.
2. **Medical & Surgical Applications:**
   - Absorbent cotton, bandages, cotton swabs.
3. **Paper Industry:**
   - Production of high-quality paper.

Jute

Biological Source

- Jute is obtained from the bast fibers of the stem of plants.
- Genus & Species: *Corchorus capsularis*, *Corchorus olitorius*
- Family: Malvaceae
- Widely cultivated in India, Bangladesh, and other tropical countries.

Chemical Nature

- Composed mainly of cellulose (60–70%) and lignin (12–14%).
- Also contains hemicellulose, pectin, and small amounts of wax.
- The fibers are long, soft, and shiny, making them suitable for textile applications.

Uses

1. **Textile Industry:**
    - Making ropes, sacks, carpets, mats, and coarse cloth.
2. **Industrial Applications:**
    - Reinforcement in composites, biodegradable materials.
3. **Agricultural Uses:**
    - Mulching mats and soil erosion control mats.

Hemp

Biological Source

- Hemp is obtained from the bast fibers of the stem of the plant.
- Genus & Species: *Cannabis sativa*
- Family: Cannabaceae
- Cultivated in India, China, and Europe for fiber, oil, and medicinal use.

Chemical Nature

- Major component is cellulose (70–75%), with lignin (5–10%) and hemicellulose.
- Also contains resinous substances, waxes, and some proteins.
- Fibers are long, strong, and flexible, suitable for ropes and textiles.

Uses

1. **Textile Industry:**
   - Making ropes, twines, coarse cloth, and sacks.
2. **Medicinal & Nutritional Uses:**
   - Seeds are used for oil (rich in omega-3 fatty acids).
3. **Industrial Applications:**
   - Biodegradable composites, insulation materials, and paper.

Hallucinogens

Hallucinogens are substances that affect the central nervous system (CNS) and produce hallucinations, causing a person to see, hear, or feel things that are not real.

Biological Sources and Examples

Source	Plant/Fungus	Active Compound
Peyote cactus	Lophophora williamsii	Mescaline
Magic mushrooms	Psilocybe species	Psilocybin
Cannabis	Cannabis sativa	THC (Tetrahydrocannabinol)
Fungus on rye	Claviceps purpurea	LSD (from ergot alkaloids)

Chemical Nature

- Most hallucinogens are nitrogen-containing compounds affecting CNS.
- Types of compounds:
  - Alkaloids: Mescaline, Psilocybin, LSD
  - Cannabinoids: THC

Uses

- Medical research: Studied in psychiatry for mental health conditions under strict control.
- Ethnobotany/Spiritual: Used in religious or ritualistic practices.
- Therapeutic potential: Limited research in treating depression, PTSD, and anxiety.
- Abuse potential: Recreational use is illegal and harmful.

Teratogens

Teratogens are substances or agents that **cause abnormal development or birth defects** in a developing embryo or fetus. They **interfere with normal growth** during pregnancy, leading to structural, functional, or biochemical abnormalities.

Sources, Nature & Effects of Some Teratogens

Example	Biological Source / Type	Chemical Nature	Use / Effect
Thalidomide	Synthetic drug	Phthalimide derivative (organic compound)	Used for leprosy and morning sickness, but causes limb deformities (phocomelia) in fetuses
Alcohol (Ethanol)	Fermentation of sugar by yeast	Organic compound (C_2H_5OH)	Causes Fetal Alcohol Syndrome: growth retardation, facial dysmorphism, CNS defects
Retinoic Acid (Vitamin A derivatives)	Fish oils	Fat-soluble retinoid	Teratogenic in high doses: craniofacial, CNS, and cardiovascular defects
Rubella Virus	Viral infection	RNA virus	No medical use in pregnancy; maternal infection causes congenital rubella syndrome (heart defects, cataracts, deafness)
Mercury	Natural element / polluted fish	Heavy metal	Neurotoxic to fetus; causes brain and developmental defects

Natural Allergens

Natural allergens are substances found in nature that can trigger allergic reactions in sensitive individuals. These reactions occur when the immune system overreacts to normally harmless substances.

Allergy

An allergy is the body's overreaction to a normal substance. When an allergic person comes into contact with an allergen, chemicals like histamine are released, causing symptoms such as:

- Sneezing
- Runny nose
- Skin rashes
- Itching
- Breathing problems

Types of Natural Allergens

Type	Source / Description	Symptoms / Effects
Pollen	From flowers, trees, grasses, and weeds	Seasonal allergies or hay fever: sneezing, watery eyes, blocked nose
Dust Mites	Tiny bugs living in dust, beds, and carpets	Triggers asthma, runny nose, sneezing
Animal Dander	Skin flakes, saliva, and urine of animals (cats, dogs)	Sneezing, itchy eyes, coughing
Mold Spores	Fungi growing in damp places (bathrooms, basements)	Coughing, wheezing, asthma
Insect Stings	Bees, wasps, ants	Local reactions, swelling; severe cases → anaphylaxis (life-threatening)