

(Unit – 2)

## Pharmacognosy – I

### [SOURCES OF DRUGS]



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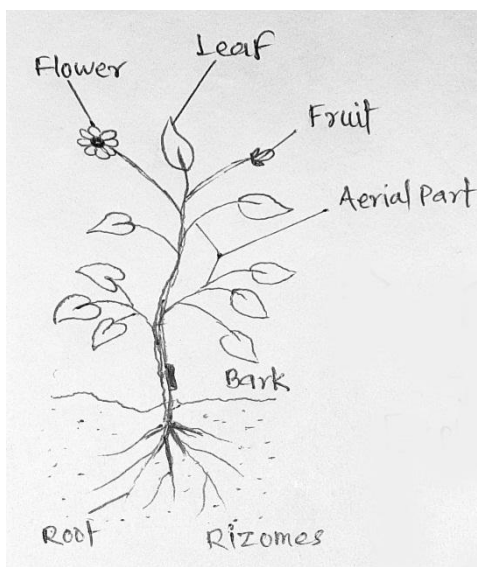
## SOURCES OF DRUGS

*Drugs are obtained from six major sources:*

1. Plant sources
2. Animal sources
3. Mineral/ Earth sources
4. Microbiological sources
5. Marine Sources
6. Plant Tissue Culture

### ➤ **Plant Sources:**

Plant source is the oldest source of drugs. Most of the drugs in ancient times were derived from plants. Almost all parts of the plants are used i.e. leaves, stem, bark, fruits and roots.



### **Leaves:**

1. The leaves of *Digitalis Purpurea* are the source of *Digitoxin and Digoxin*, which are cardiac glycosides.
2. Leaves of *Eucalyptus* give oil of *Eucalyptus*, which is important component of cough syrup.
3. Tobacco leaves give *nicotine*.
4. *Atropa belladonna* gives *atropine*.

### **Flowers:**

1. *Poppy papaversomniferum* gives *morphine (opioid)*
2. *Vincarosea* gives *vincristine and vinblastine*
3. Rose gives rose water used as tonic.

**Fruits:**

1. Senna pod gives *anthracene*, which is a purgative (used in constipation)
2. Calabar beans give *physostigmine*, which is cholinomimetic agent.
3. Amla gives vit-C used as antioxidant

**Seeds:**

1. Seeds of Nux Vomica give *strychnine*, which is a CNS stimulant.
2. Castor oil seeds give *castor oil*.
3. Calabar beans give *Physostigmine*, which is a cholinomimetic drug.

**Roots:**

1. Ipecacuanha root gives *Emetine*, used to induce vomiting as in accidental poisoning. It also has amoebicidal properties.
2. Rauwolfia serpentina gives *reserpine*, a hypotensive agent.  
Reserpine was used for hypertension treatment.

**Bark:**

1. Cinchona bark gives *quinine and quinidine*, which are antimalarial drugs. Quinidine also has antiarrhythmic properties.
2. Atropa belladonna gives *atropine*, which is anticholinergic.
3. Hyoscyamus Niger gives *Hyoscine*, which is also anticholinergic.

Part Uses	Name of Medicinal Plant	Active Chemical Constituents	Uses
Leaves	Digitalis	Digitoxin	Cardiotonic
	Senna	Sennosides	Laxative
Flowers	Clove	Eugenol	Dental Analgesic
Fruits	Opium	Morphine	Potent Analgesic
	Amla	Vitamin C	Antioxidant
	Bael	Marmesin, Acgelin	Antidiarrheal, Hepatoprotective Properties
Seeds	Castor Oil	Ricinoleic Acid	Laxative
	Mustard Oil	Oleic Acid	Antarthritis
Roots	Rouwolfia	Reserpine	Antihypertensive
	Ipecac	Emetine	Emetics
	Ashvagandha	Withanolides	Anti stress Property

**➤ Animal Sources:**

1. Pancreas is a source of Insulin, used in treatment of Diabetes.
2. Urine of pregnant women gives human chorionic gonadotropin (HCG) used for the treatment of infertility.
3. Sheep thyroid is a source of thyroxine, used in thyroid deficiency eg. Goiter, Hypo & Hyper thyroidism.
4. Cod liver is used as a source of vitamin A and D.
5. Anterior pituitary is a source of pituitary gonadotropins, used in treatment of infertility.

6. Blood of animals is used in preparation of vaccines.
7. Stomach tissue contains pepsin and trypsin, which are digestive juices used in treatment of peptic diseases in the past. Nowadays better drugs have replaced them.

S.No.	Animal Part/Product uses as drug	Hormones/Chemicals	Uses
1.	Pancreas	Insulin	Diabetes
2.	Blood	Vaccines	Several type of Disease treatments
3.	Sheep Thyroid	Thyroxine	Thyroid Insufficiency
4.	Cod liver Oil	Vitamin A & D	Vit. A is useful for Vision & Vit, D is for Immune system
5.	Stomach Tissue	Pepsin & Trypsin	Used in Peptic Disease
6.	Posterior Pituitary gland (Source: Adrenal Gland)	Oxytocin	Labor pain & Lactation
7.	Epinephrine/Adrenaline	Adrenaline	Acute Asthma Treatment
8.	Urine of Pregnant Women & Horse Serum	Human Chorionic Gonadotropin (HCG)	Treatment of Infertility
9.	Pancreas of pig	Pancreatin	Pancreatitis Treatment
10.	Human Plasma	Fibrinolysin	Thrombosis Treatment

### ➤ Mineral Sources:

#### 1. Metallic and Nonmetallic sources:

1. Iron is used in treatment of iron deficiency anemia.
2. Mercurial salts are used in Syphilis.
3. Zinc is used as zinc supplement. Zinc oxide paste is used in wounds and in eczema.
4. Iodine is antiseptic. Iodine supplements are also used.
5. Gold salts are used in the treatment of rheumatoid arthritis.

#### 2. Synthetic Sources:

When the nucleus of the drug from natural source as well as its chemical structure is altered, we call it synthetic.

Examples include Emetine Bismuth Iodide

#### 3. Semi Synthetic Source:

When the nucleus of drug obtained from natural source is retained but the chemical structure is altered, we call it semi-synthetic.

Examples include Apomorphine, Diacetyl morphine, Ethinyl Estradiol, Homatropine, Ampicillin and Methyl testosterone. Most of the drugs used nowadays (such as antianxiety drugs, anti-convulsant) are synthetic form.

#### 4. Miscellaneous Sources:

1. Fluorine has antiseptic properties.
2. Borax has antiseptic properties as well.
3. Selenium as selenium sulphide is used in anti-dandruff shampoos.
4. Petroleum is used in preparation of liquid paraffin

#### 5. Clay Minerals:

1. Calamine:
  2. Bentonite:
- Both are used in preparation of Talcum Powder, Cream, Beauty Products  
Cosmetic Preparations.

#### ➤ Microbiological Sources:

- Several types of bacteria play an important role in the production of several types of life saving drugs.
  - These are obtained from microorganisms and they used to kill the microbes & to stop the growth of microbes.
1. Penicillium notatum is a fungus which gives penicillin.
  2. Actinobacteria give Streptomycin.
  3. Aminoglycosides such as gentamicin and tobramycin are obtained from streptomyces and micromonosporas.

S.No.	Drugs	Obtained from Microorganism
1.	Penicillin	Penicillium Notatum
2.	Chloramphenicol	Streptomyces Venezuelance
3.	Griseofulvin	Penicillin Grisofullivum
4.	Streptomycin	Streptomyces griseus
5.	Neomycin	Streptomyces Fradiae

#### ➤ Marine Sources

Drug Obtained from Marine (Sea/Ocean)

Examples: Seaweed, Soft coral, Sponges, Fish, Microorganism

##### 1) Anti-microbial agents: [Cholera (Haiza), Tuberculosis (TB), Pneumonia]

- Cephalosporin: - Obtained from Marine Fungus [Cephalosporium Acremonium]
- Istamycin A & B: - Marine Streptomycin

##### 2) Anti-viral Agents: [Hepatitis, Rabies, Small pox, Chicken pox, Flu, HIV, Ebola]

- Ara A (Vidarabine): -Caribbean Sponge [Tethya Crypta]
- Avarol&Avarone: - Sponge [Disideaavara] used in AIDS Treatment
- Fucoidan: - Brown Algae [FucusVesiculosus]

**3) Anti-Parasitic Agents:** [Malaria, Diarrhea, Hookworm]

- Domoic Acid: - Red Algae [Chondria Asmata] used in the treatment of anthelmintic
- $\alpha$ -kainic Acid: - Red Algae [Chondria Asmata]

**4) Cardio Vascular Agents: -**

- Laminine: - Specific type of red algae [hypotensive effect]
- Octopamine: - Octopus [Octopus Vulgaris]
- Spongiosine: - Caribbean Sponge [Cryptotethya Crypta]

**5) Anti-Cancer Agents: -**

- Ara C (Cytarabine): - Caribbean Sponge [Tethya crypta] used in treatment of leukemia
- Crassin Acetate: - Caribbean Gorgonian [Pseudo Plexaura Porosa]

**➤ Plant tissue culture:**

Invitro Cultivation of plant Cell/tissue/Organ in nutrient media/growth media (Solid/Liquid/ Semi Solid) under aseptic conditions and controlled environment (light, PH, temperature). This type of work / culture is called plant tissue culture.

- Sterile/Aseptic: - free from Microorganism
- Invitro Cultivation: - plant tissue Culture

Plant tissue culture is based on Totipotency (Cell Potency)

Totipotency: Ability or power of a single plant cell to develop in entire plant.

**Advantages:**

1. Huge amounts of drugs can be produced.
2. Drug can be obtained in pure form.
3. It is less antigenic.

**Disadvantages:**

1. Well-equipped lab is required.
2. Highly trained staff is required.
3. It is a complex and complicated technique.

**Application of Plant Tissue Culture: -**

1. Production / Regeneration
2. Endangered plant Species conservation
3. Large Scale Production of Bio- active compounds.

Examples:

- ✓ Digitalis (leaf) ➡ Digoxin
  - ✓ Rauwolfia (root) ➡ Reserpine
  - ✓ Atropa Belladonna (leaf) ➡ Atropine
  - ✓ Papaya (Fruits) ➡ Papain
4. Herbicide resistance / Disease resistance plant
  5. Hybrid Plant/ Regeneration of Transgenic plant

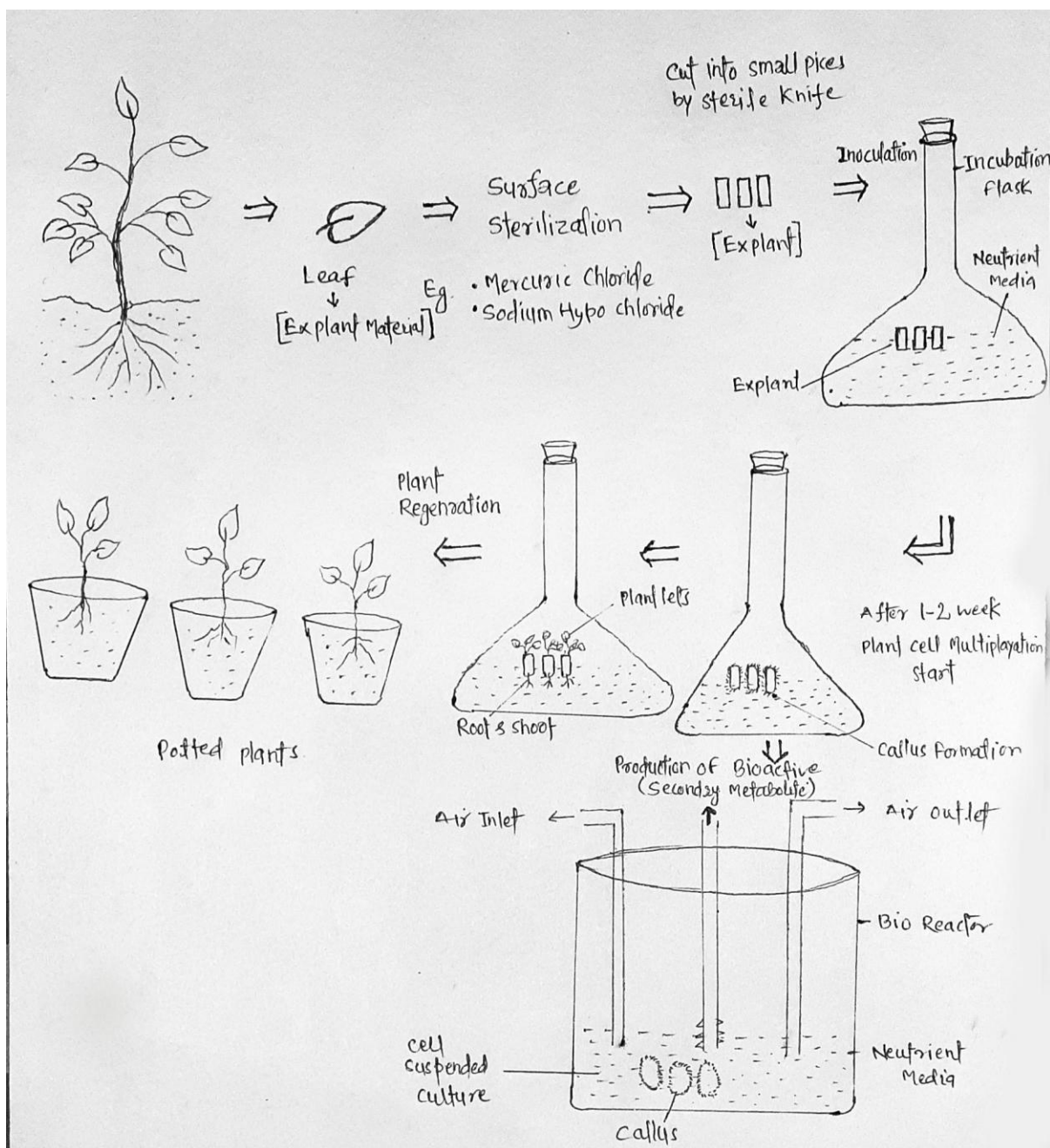


Figure :- Step by Step Procedure of Plant Tissue Culture