Unit I Introduction to Pharmacognosy

a Defination, History, Scope and development of Pharmacognosy.
b Sources of Drugs - Plants, Animals, Marine & Tissue culture.
c Organized drugs, unOrganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo-gum-resins).

Classification of drugs:
Alphabetical, Morphological, Taxonomical, Chemical, Pharmacological, Chemo and serotaxonomical classification of drugs.

Quality control of Drugs of Natural Origin:
Adulteration of drugs of natural origin.
Evaluation by organoleptic, microscopic, physical, chemical biological methods and properties.
Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

a) - - - - - - - ?

* # Pharmacognocy

Pharmacon — Drug

Gonosis — Study / knowledge

Pharmacognosy is a branch of science that deals with the study of crude drugs which are obtained from natural sources or origin like plants, Animals, minerals and marine sources.

* # Phyto chemistry

Phyto — related to plants

Chemistry — related to chemical compounds

The chemicals which are obtained from plants.

Or

Phytochemistry is the study of phyto-chemicals, which are chemicals derived from plants.

Page No.
Date

Crude drugs = [Drugs obtained from natural sources]

A crude drug is any naturally occuring, unrefined substance derived from organic or in-organic sources such as plant, animal, bacteria, organs or whole organisms intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in humans or other animals.

or

- The word crude drug itself is self-explanatory and is used with the meaning of 'simple drug' and also as it exists in the natural form.
- The crude drugs are plant or animal drugs that have undergone no other process than collection and drying.

- Broadly, pharmacognosy is defined as the scientific & systematic study of structural physical, chemical and biological characters of crude drugs along with their history, method of cultivation, collection and preparation for the market.

Page No.
Date

- History of Pharmacognosy

The Great Contributors

1 Hippocrates = He is a greek physician (460-360 B.C.) known as father of medicine Deals with anatomy and physiology of human beings.

2 Aristotle = the renowned philosopher (384-322 B.C.) is well known for his studies on animal kingdom.

3 Dioscorides = a Greek physician in 78 A.D. described several plants of medicinal importance in "De materia Medica"

4 Galen = He is also a Greek pharmacist (131 - 200 A.D) describe the various methods of prep^n containing active constituents of crude drug, and even at present the branch dealing with the extraction of plant and animal drugs is known as Galenical Pharmacy.

5 Seydler = He is a German scientist, who coined the term pharmacognosy in 1815 in his work entitled "Analecta Pharmacognostica" from combination of two Greek words viz; pharmakon = a drug and gignosco = to acquire the knowledge of.

Page No.
Date

- Scope of pharmacognosy

1 Herbal medicines
2 Cosmetics
3 Industry
4 Academics
5 Food and drug
6 Traditional system of medicine

Drug = A drug is any substances that can be inhaled, inject, smoked, absorbed via patch on the skin or dissolved under the tongue that causes a physiochemical change in the body.

or

A drug is the substance intended for use in the diagnosis, cure, mitigation, treatment or prevention of disease in human & animals.

Sources of Drug :

1. Plant Sources
2. Animal Sources
3. Mineral Sources
4. Marine Sources
5. Plant tissue culture.

Page No.
Date

1 Plant Sources:

1) plant source is the oldest and longest source of drug:
2) They has been used in the treatment of various diseases from ancient time.
3) The traditional system of medicine like Ayurveda, Siddha, Homeopathic and unani systems are based on the use of plants.
4) Many of the plants products are having important therapeutic agents like alkaloids, glycosites, flavonoids, enzymes, volatile oils, etc.
5) Examples =

Sr no.	Parts	Name	Constituents
1.	Leaves	Digitalis, Eucalyptus Tobacco	Digitoxin, Digoxin Eucalyptus oil Nicotine
2.	Fruit / Flower	Opium Vinca	Morphin, Codeine, Heroine, Amorphine, Vincristine, Vinblastine.
3.	Roots	Ipecac Rauwolfia	Emetine, Reserpine
4	Bark	Cinchona	Quinine (Anti-malaria) Quinidine (Anti-erythmia)

Page No.
Date

2 Animal Sources :

→ It is a second largest source of drug.

→ Certain animal part and animal products are used of drug.

→ The major groups of animals products used in the medicine are hormone, enzymes, organs, bile acids.

a Hormones : Thyroidism modify preparations of gland of sheep and pigs. It is given orally to treat patients suffering from thyroid insufficiency

→ Pancreas is a source of insulin used in the treatment of diabetes.

→ Epinephrin is a hormone produced by adrenal medulla and used as a vaso constrictor drug.

→ Oxytocin is a polipeptide hormone obtained from pituitary gland by cattles and pigs

b Enzymes :

→ Pepsin is a protiolytic enzymes of gastric juice produced from fresh pig stomach.

→ Trypsim is a protiolytic enzymes prepared from extract of pancreas.
It is used for the topical application of the treatment of wounds, ulcer, etc.

→ Pancreation is a preparation which contain enzymes of pancreas, which is used to treat digestion problems it is prepared from pig of pancreas.

C Animal extractives organs :
→ Liver & Stomach preparations and bile are the example of this group.
→ Honey from Honey bee
→ Beewax from bees
→ Cod liver from shark.
→ Wool fat from Sheep.
→ Carminic Acid from cachineal
→ Venums from Snake

3 Marine Sources :
Major part of earth is covered with water bodies. Hence the bioactive compounds. (chemical constituents) are ~~also~~ also obtained from marine flora (Plant) and Fauna (Animals) used for the treatment of many diseases.

Page No.
Date

⇒ Classification of Drug of Marine Sources

i) Antimicrobial agents / Antibiotics
- Cephalosporin
- Tetramycin
-
-

ii) Antiviral Compounds
- Ara A
- Oppositol
- Avarona & Avarol

iii) Antiparasitic Compounds
- Domoic Acid
- α-kainic Acid
- Laminine
- Bengemide f.

iv) Anticancer Agent
- Sinularin
- Halitoxin
- Asparidal
- Aplidin

v) Cardiovascular Agents
- Octopamine
- Tetramine
- Saxitonin
- Laminine

vi) Anti-inflamation / Antiplasmodic Agent
- Tetradoxin
- Menoalide

4 Plant tissue Culture =

Plant tissue culture is a technique that is used to grow plant cells tissues or organs under starile conditions on a nutrient culture medium.

It is widely used to produce of plants.

It is technique of control production of usetul secondary metabolites.

Advantages of plant tissue culture =

- production of extract copy of plants
- To quickly produce mature plants,
- production of genetically modified plants.
- production of disease free plants.

Plant tissue Culture as a source of drug.

S no.	Secondary Metabolites	Plant Source	Type of Culture
	Reserpine	Rauwolfia	Suspension Culture
	Vinblastin	Vinca	cell Culture
	Micatine	Tobacco	Suspension Culture

Section A = 'C'

Page No.
Date

Sr no.	Organized drugs	Unorganised drugs
1.	These are "organs of plants and Animals and are made up of cells and having definite structure.	These are obtained from parts of plants by some ~~product~~ process of extraction and purification.
2.	This drugs are named as flowers, seeds, fruits, bark, stem, etc.	This drugs are named as extract, latex, juice resins etc.
3.	They are solid in nature.	They are solid, semi-solid, and liquid in nature.
4.	Microscopical study are useful in quality control.	Chemical test are perfor for quality control or ivaluation.
5.	Examples: Parts of plants exampl -es: i) Leaves → Eucalyptus, Tobacco Digitalis. ii) Wood → Sandal wood iii) Bark → Cinchona, Cinnamon iv) flower → Vinca, Clove, Saffron.	Examples: Classification Resins → Asafoetida Gums & mucilages → Acacia, Tragacanth, Guar gum Latex → opium (afeem) Waxes → Bees wax.

Dried Latex :

→ A latex is a product that contains special / secratary tissue. (the tissues that are concerned with secretion of gum resin volatile oils and other substances.).

→ A latex is a milky fluid which is usually exuded after tissue injury / incission.

→ It is usually a white aqueous suspension in which small particle of oil globules are suspended. This natural suspension of milky consistancy may contains proteins, alkaloids, starch, resins, gums, oils, tanins, sugar, etc that cogulate on exposure to air.

eg. ~~opur~~ opium papain, etc.

→ These pharmaceutical latex were collected, dried and therapeutically used.

Dried Juices =

These juices are obtained from extraction or pressing of vegatables and fruits.

The incissions are made up to respective parts of plants, collected and dried.

examples = leaves = Aloe, Steam = Kino

Dried extracts =

→ An extract is a concentrated preparation of a drug which is obtained by removing active constituents of the drug with suitable solvent and evaporating the solvent and evaporating to obtained a residual mass or powder.

→ The extracts were prepared by using water, alcoholic, hydro-alcoholic solutions.

example = tea, gelatin, catechu, etc.
↳ [extract from acacia used as food adition]

Gums =

→ Gums are the abnormal product of plant metabolism formed by injury of the plants and by a break down of the cell walls.

→ They are produced by process known as Krummossis.

→ They are translucent amorphous substance of plant hydrocollides produced by plants.

→ They are soluble in water and gives a viscous sticky solutions.

→ They are insoluble in alcohol and other organic solvents.

eg: ~~tragenth~~ tragacanth, gum, acacia, Guar gum, etc.

Mucilage:

→ Mucilage are also plants products which are similar to gum. but are generally the namely products of plants metabolism formed within the cell.

→ With water it forms a slimy mass but don't dissolve.

→ In pharmacy gums and mucilage are used as a binding and thickening agent.

eg: Isabgal, Agar, Fenugreek Squill.

Oleo-Resins =

→ These are semisolid extracts which are composed of resin with volatile oil.

→ Oleo-resin are prepared from:

* Ginger
* Clove
* Capsium
* Turmeric
* Cardamum (Elachi)
* Cinnamon

→ They are used as a flavouring agent in perfumery some are used as medicinally.

Oleo gum resin =

→ It is a mixture of volatile oil gum and resin ie released from some plants and trees.
ex: Asafoetida, Myurh.

Classification of Crude drugs:

Crude drug: The crude drug are the unprocessed form of drug which are directly obtained from natural source like plants, animals etc.

→ For the proper & adequate study of crude drug it is necessary to arrange them in scientific and systemic manner.

• Classified in seven types:

1 Alphabatical classification
2 Morphological classification
3 Pharmacological classification
4 Chemical classification
5 Taxo-chemical classification
6 Chemo-taxochemical classification
7 Sero-taxochemical classification

1 Alphabatical classification of Crude drug:

→ In this classification the crude drug are arrange according to the alphabates

→ Most of the Reference book and pharmaco-pia are arranged according to the latin or english name they are:

i) British pharmacopia
ii) British Pharmaceutical codex
iii) U.S.P.
iv) I.P.
v) British Herbal pharmacopia.

Example:

A ⇒ Amla, Agar
B ⇒ Balsam, Bentonite
C ⇒ Cinnamon, Cinchona
D ⇒ Dhatura, Digitalis
E ⇒ Eucaluptus
F ⇒ Fennel
G ⇒ Ginger
H ⇒ Honey
I ⇒ Ipecac
J ⇒ Jatamansi
K ⇒ Kalmegh
L ⇒ Lemon
M ⇒ Myrrh

N ⇒ Nutmeg, Neem
O ⇒ Opium
P ⇒ Pepper, Papaya
Q ⇒ Quassia
R ⇒ ~~Rou~~ Rauwolfia
S ⇒ Senna
T ⇒ Tulsi, Turmeric
~~U~~ ⇒
V ⇒ Vinca
W ⇒ Withonia (Ashawgandha)
Y ⇒ Yeast

2 Morphological classification system of crude drug.

The crude drug are classified in organized and unorganized manner:

i) Organized drug = In this drug are classified as:

	Parts		Drugs
a)	Bark	⇒	Cinchona, Cinnamon
b)	Root	⇒	Rauwolfia liquorice
c)	Leaves	⇒	Eucalyptus, Senna
d)	Flower	⇒	Saffron, Clove, Vinca
e)	Fruits	⇒	Opium, Bale, Fennel.
f)	Seed	⇒	Almond, coffee, Beans.
g)	entire plants	⇒	Vinca (Vinusting, Vinblastin) Anticancrous drug.

ii) Unorganized drug =

Classification / Category		Drugs
1) extracts	→	Tea, Gelatin
2) Latex	→	Papaya, Opium
3) fixed oil	→	Castor oil
4) Volatile oil	→	Eucalyptus, Sandle wood oil
5) Juice	→	Amla, Aloevera
6) Gum	→	Tragacanth, Acacia, Guar.

3 Pharmacological Classification =

According to this classification the crude drugs are classified in P. cological in Therapeutic activity they are as follows

P. cological Activity		Drug
i) Carminatives [Agent that, expel out gas from the body.]	⇒	fennel, clove, corriander, cinnamon.
ii) Antimalaria	→	Cinchona, Artimisia
iii) Anticancer	→	Vinca, Taxus
iv) Anti inflammatory	→	Turmeric, Colichecum
v) Spasmodic	→	Dhatura, Hyoscyomus
vi) Bitter	→	Gentian, Cherata
vii) Expectorant	→	Opium, liquorous

4 Chemical Classification =

In this classification the drug is arranged according to the chemical or active constituents present on crude drug, they are as follows:

eg. Chemical or active Constituents "Drugs"

i) Alkaloids ⇒ opium, Vinca, Cinchona, datura, Nux-Vomica

ii) Glycosides ⇒ Senna, Aloe, Bitter, Almonds.
glycon + aglycon → shows therapeutic activity
(sugar) (non-sugar)

iii) Volatile oils → eucalyptus, clove, fennel, Cardemum

iv) Vitamins → Shark liver oil, cod liver oil.

v) Enzymes → Papain, Trypsin.

vi) Carbohydrates → Tragacanth, honey, agar, Isapgo

vii) Lipids → paraffin oil (wax), Bees wax

viii) Resin → Asafoetida, myrh, ginger.

Page No.
Date

5 Taxonomical Classification =

In this classification the drug are arranged according to phylum class, sub class, order, family genus and species.

Sr no	Drug	Division	Class	Order	family	Genus	Species
1)	Senna	Angio sperm	Dicotlydon	Rosales	Leguminosa	Cassia	Angustifolia
2)	Fennel	"	"	Umbilli-ferae	Umbelli-feral	foenic-ulum	Vulgare
3)	Nux-Vomica	"	"	Gentiana-les	Logania-ceae	Stryc-hnos	Nux-Vomica

6 Chemotaxonomical Classification =

→ Applying chemistry to the taxonomy as chemotaxonomical.

→ ~~These~~ This classification is based on the chemical similarities of a taxon based on the existance of the relationship b/w the plant & its constituents.

→ In this plant secondary metabolite are taken into consideration. Researches have proved already regarding the similarities of constituents from different plants species of a Gene.

a Tropane alkaloid = Solanceae family
eg. Datura,
Belladonna,
Hyoscyamus.

b Rutin = Rutaceae family
↳ by Flavinoids → cent in cetrus fruits
e.g. Amla lemmon etc green tea.

7 Serotaxonomical Classification =
- The sero-taxonomy can be explained as the study about the application 'or' the utility of serology in solving the taxonomical problems.

- Serology can be defined as the study of Antigens, Antibody reaction.

→ Antigens = are those substances which can stimulate the formation of antibody.

→ Antibody = is the highly specific protein molecule produced by plasma cell in the immune system.

→ This classification expresses the similarities and dissimilarities among diff" texa

→ It determines the degree of similarities between species 'Genera' or 'Genus' family etc. by comparing the reaction with

antigens from various plant texa with antigens from various antibodies present against a given taxen.

Drug Adulteration

Definition - The term adulteration is a practice of mixing or substituting the original drug partially or wholy with other similar looking substance.

→ The Adulterated drug have loose its actual or original therapatic properties & some time form a toxic product.

Condition of Adulteration :

1) Admixture : Adding of substances due to accidently or carelessness.
eg: Collection of two different species of plant or drug in a field there may be a change of mixing above species due to carlessness or ignorance.

Page No.
Date

2 Sophistication : It means intentionally mixing upto original crude drug with adulterant.
eg. brick powder use in Red Chilly powder.

3 Deterioration = Due to microbial attack high temperature, incorporation of impurities causes decrease in quality of drug.

4 Substitution : It means use of similar looking substance implace inplace of original drug.
eg: Cotton seed oil in place of olive oil.

5 Spoilage : Due to improper storage & attacking of microbes causes therapeutic loss of product and may be also form of toxic product.

6 Interlarity : (low quality product)
In this mixing of original drug with infertive quality product.

Types of Adulteration

Direct Adulteration (intentionally / knowingly)

Indirect Adulteration (unknowingly / unintentionally)

1 Intentional Adulteration :

Reasons =

- Price of drug is normally high.
- Product is not sufficient.
- just for profit.

i) Adulteration with Similar looking substance =
eg : papaya seed in black pepper,
Bees wax with Japan wax
Indian Senna with Arabian Senna.

ii) Adulteration with exhausted material =
eg : exhausted clove with a volatile oil

iii) Adulteration with Artificially manufactured substances :
eg. Bees wax with Parrafin wax

iv) Adulteration with Synthetic chemical :
eg. Citral in Citrous oil (lemmon)

v) Addition of useless part of some plant:
eg. Stem part in Senna leaf

vi Adulteration of Powder:
In this the powder drug Adultrates with waste products. eg. bricks powder is mixed with red chilli powder.

2 Indirect Adulteration:
Reasons=
Due to carelessness, ignorance, accidently and unknowingly.

i) Faulty or careless collection: Here adulteration is caused by misshandling of drugs by collection & supplies.

ii) Improper processing: In this case the extranious matter is not removed after collection, improper, drying, etc.

iii) Improper Storage: In this case proper storage of drug is not done, the drug stored in unsealed bottle or the drug box. stored in open area may lead to degreadation of drug cause adulteration.

iv) Similarities in morphology =
eg: Mucuna prunines is morphologically similar to Mucuna utilis.

v) Name Conclusion: The adulteration also happen when the ~~pronounced~~ pronounciation of drug is almost same.

eg: Parapatuka (is used in ayurvedic system of medicine)
Parpadagem (used in Siddha system of medicine).

Quality control of Crude drug:

Quality control is a system of maintaining standard in product by ensuring it identity purity and its quality

Evaluation Method of Crude Drug:

1) Organoleptic / morphological evaluations
2) Microscopic evaluation
3) Chemical evaluation
4) Physical evaluation
5) Biological evaluation.

Page No.
Date

1 Organoleptic / Morphological evaluation:
It is a technique of qualitative evaluation based on the morphological and sensory prosites.

- Morphological evaluation: In this the drugs are identified on the basis of size shape and other specific feature.
- Organoleptic evaluation: In this case drugs are identify by the help of sensory organ.

- colour, odour, touch, texture, taste, etc.

2 Microscopic evaluation method:
- In this method the organised drugs are use to identify by its histological and morphological character, cell. (arrangement):
- The characteristics like trichomes (hairy like structure present in Dhatura), fibers, Vascular bundles, Xylem, phylum, cholenchyma & other cell contents can be studied under this.

3 Chemical evaluation ✱ method : It involves the determination of crude drug by chemical test.

i) Qualitative test : Quality determine

ii) Quantative test : Quantity determine

iii) Chemical assay : % of drug

iv) Instrumental analysis : functional group determine by chematography & Spectroscopy.

i) Qualitative test :

S. no	Metabolites / constituents	Test
1)	Alkaloids	Dragendruff test Mayer's test Wagner's test Hagen's test.
2)	Glycosides	Legal test Baljet test Berntrager test Saponin test

Page No.
Date

3 Carbohydrates ~~Molish~~ Mollish test
Bendict test.
Felling's test.

4 Proteins millien's test
Biuret test
Ninhydrin test

5 flavouride ~~Sh~~ Shinoda test

ii Quantative test:
eg Ash value, Iodine value
Ester value, Acid value
Saphonification value

iii Chemical Assay:
By this method the approximate value of total phytoconstituents in a crude drug is determined.

iv) Instrumental Analysis:
It is used to Analysis the chemical group of phyto constituents using chromatographic and spectroscopic method:

- The chromatographic method include ⇒

a) TLC - Thin layer chromatography
b) Gas Chromatography
c) Paper Chromatography
d) HPLC - High Pressure Liquid Chromatography / High performance Liquid Chromatography

- Spectroscopy method include ⇒

a) UV visible spectroscopy
b) NMR - Nuclear magnetic Resonance Spectroscopy
c) Infrared spectroscopy

4 Physical evaluation Method :

The physical evaluation method for crude drug are as follows :

i) Moisture content : The percentage of active constituents of crude drug is expressed in air dry basic

→ It should be minimized to prevent the de-composition of crude drug or due to chemical change of microbial contamination.

→ The moisture contain content is determined by the heating of drug at 105°C in oven to a constant weight

Page No.
Date

* Drug — Moisture content in percent
1) Aloe — Not more than 10 %
2 Digitalis — Not more than 5 %

ii) Viscosity : The viscosity of liquid drug is constant at a given temperature.

iii) Melting point : To check the purity of drug this parameter is used.

→ for pure chemicals, phytochemical M.P. is very sharp and constant.

* Drug	M.P in °C
a Wool fat	34° to 44° C
b Bees wax	62° to 65° C
c Cocoa butter	30° to 33° C

iv) Solubility = An adulterant can be detected in a crude drug by solubility studies.
eg : Alkaloidal bases are soluble in organic solvent.

Page No.
Date

v) Optical Rotation activity : It is determined by using no lamp as a light source at 25° C.
Certain substances are found to have the property of rotating the plane polarised light in the pure state.

* Drugs	Angle of optical rotation
a Honey	+13° to -15°
b Castor oil	0° to -1.5°

vi) Ash value = The residue remaining after insigration in that ash contain drug.

- It reconstant the inorganic salts like carbonates, phosphates, silicates etc.

5 Biological evaluation = This methods are perform on living animals or experimental animals like Rat, mice, rabbit, cat, etc. isolated organ and tissues and according as bioassay or biological assay.

Page No.
Date

- The plant extracts are used here to determine the P' cological activity, potency & toxicity.

⇒ In this method following activities are checked :

1) Anti diuretic Activity
2) Analgesic Activity
3) Anti ulcer Activity
4) Anti-inflamatory Activity
5) Anti-Pyretic Activity

Quantitative Microscopy of Crude Drug :

Lycopodium Spore Method :

It is an analytical technique used for powdered drug it determin-es the no. of spore present in mg of sample.

- Here Lycopodium is taken as a reference or standard drug about 94,000 Spores are found in 1 mg. of powder lycopodium.

A powdered drug is evaluated by lycopodium spore method -

eg the % purity of ginger powder is calculated by.

$$\% \text{ purity of drug} = \frac{N \times W \times 94000 \times 100}{S \times M \times P}$$

where,

N = no. of characteristic structure in 26 sheets.
W = weight of lycopodium in (mg)
S = no. of lycopodium spores
M = Weight of Sample (in mg)
P = 2 lack thousand

In case ginger starch grain powder.

Leaf Constant:

The determination of leaf constant can be done by.

a) Palisalde ratio
b) Vein islet no.
c) Vein termination no.
d) Stomatal index

a) Palisade ratio: It is the arrange no. of Palisade cell present below each epidermal cell.

b) Vein islet no: It is defined as the no. of vein islet per sq. mm of the leaf surface midway between the midrip and the margin.

c) Vein termination no.: It is defined as the no. of vein led termination per sq. mm at the leaf surface mid way between midrip margin is per sq. mm.

d) Stomatal index: It is the percentage which the no. of stomatas forms of the total no. of epidermal cells.

$$SI = \frac{S}{E+S} \times 100$$

where,

S = no. of stomata per unit Area

E = no. of epidermal cell in the same unit Area.