L1
PHARMALOGHOSY

Which literally means a knowledge of pharmaceuticals has been a part of the medical arts and sciences since mankind first began to treat illnesses. This name is formed from two Greek words:

**PHARMAKON** → **DRUG**
**GNOSIS** → **KNOWLEDGE**

Pharmacognosy may be defined as:
“An applied science which deals with biological, biochemical and economic features of natural drugs and their constituents”.

Having their origin in the plant and animal kingdoms.

-Crude Drugs:
Are vegetables or animal drugs, which consist of natural substances that have undergone no other processes than collection, and drying.

-Derivatives:
It means a single substance or a mixture of substances separated by various means and is employed in more specific manner from crude drugs.

-Preparation of Drugs for the Commercial Market-
1- Collection:
The most advantageous time of collection during that period when that plant part constituting is highest in its content of active principles and when the material will dry to give the maximum quality and appearance.

-General Rules for the Collection-
a- **Roots**: Should be collected in the full after the vegetative processes have ceases.

b- **Leaves** and **Flowering Tops**: Should be collected when photosynthesis in most active, which is usually about the time of flowering and before the maturing of the fruit and seed.

c- **Flowers**: Should be collected prior tp or just about the time of pollination.

d- **Fruits**: May be collected either before or after the ripening period.(black pepper).

e- **Seeds**: Collected when fully matured, when most of them have ripened but before the fruits have opened.

**2- Harvesting**: The mode of harvesting varies with the drug being produce and with the pharmaceutical requirements. Some drug may be collected by hand labor or mechanical devices.

**3- Drying**: to remove sufficient moisture to insure good keeping qualities and prevents molding the plant material can be dried either by natural sun drying or by the use of artificial heat.

**4- Garbling**: It consists of the removal of waste.

**5- Packaging**: It depends upon their final disposition leaf and herb material usually baled with power balers in to solid compact mass need proof cans or boxes.

**6- Storage and Preservation**: Proper storage and preservation are important factors in maintaining a high degree of quality of the drug. Houses should be fire proof, steel, concrete of brick construction the preservation of drug against attacks by insects must not be over looked which infest vegetable drug for destruet of insect and prevention of their attacks the drug must be expose to a temperature of 65° C.
Animal drug:
- Many animal drugs are produced from domesticated animal such as: sheep – cattle – hogs – dear ….etc.
  which produced:
  ↓  
milk product
hormones
active const: endocrine product
  ↓  
enzymes
Lard
Lanolin

in plant: active consist:

Drug adulteration:
The debasement of any article, which involve a number of different condition:
- inferiority.
- Spoilage.
- Deterioration
- Admixture and substitution from the stand point of present day comers.

In plant:
Actocont: Alkaloids – volatile oil – fixed oil, CHo – Glycosides…etc.

L4 Evaluation of drug:
Means to identify and to determine its quality and purity.

Quality refers to:
Amount of medicinal principles or active constituents present.
These const. are classified in to groups of non-protoplasmic cell contents.
The methods which may be classified as:
1- Organoleptic evaluation.
2- Microscopic (دقيقة الحجم – عن طريق المايكروسكوب)
3- Biological.
4- Chemical.
5- Physical.

1- organoleptic means:
Evaluation by means of the organs of sense, and include the macroscopis appearance of the drug:
it its odor and taste and feel of the drug to the touch, or the sound of its fracture.
2-Microscopic Evaluation:
It is essential to study of adulterants in powdered plant and animal drug and also to identification of the pure powdered drugs.

3-Biological Evaluation:
the pharmacological activity of certain drug has been applied to their evaluation and standardization.
As say on living animals as well as on intact or excised organs often indicate the strength of drug or its preparation living organisms are used such as:
- Bacteria.
- Frog.
- Rats.
- Guinapig.
- Cat.

4-Chemical Evaluation:
Ch. Eva. Of crude drug and their products have become increasingly important.
Chemical test are employed to:
1- identify crude plant drug such as:
   red color develop in:
   _cascara_ Sagrada
   when treated with ammonia test solution.
2- to ascertain the purity of certain drugs such as:
   the test to detect the presence of inorganic iodides in thyroid tablets by adding starch test solution.

5- Physical Eva.:
   The application of physical constants is extensively applied to the active principle of drug, such as: In plants
   alkaloids – Volatile oil – fixed oil…..etc.

The physical Eva. Are:
Solubility, specific Gravity, Optical Rotation, Refraction index, Melting point, water content.

**Chromatographic Study of Drugs**
In recent years the study of chr. Has become prominent as a means of:
Separating and analyzing organic and inorganic material.
The analyzing material may be either qualitatively or quantitatively.
Which is a wide application in research in pharmacoghosy to identity and purity of drug.
It may be defined as:
A method of analysis in which the flow of the solvent or gas promotes the separation of substances by differential migration from an arrow initial zone in a porous sportive medium.

Four types of chro.:
1- Colum.
2- Paper.
3- Thin – Layer.
4- Gas.

Colum chr.:
Uniform percolation of fluid through a column of more or less finely divided substances of the fluids.
It is used where large quantities of the material to be tested.
In this method many adsorbents have been used such as:
Sucrose – Calcium or Sodium Carbonate, activated alumina….etc.
The Solvent include: Petroleum – ether – acetone, alcohol, water.

- Paper chro:
Because of the simplicity of the apparatus and is more popular, with a large number of analyses can be conducted simultaneously.

- Thin Layer chro.:
Is a modification of the above types of chro. It’s adaptable to the analysis of small amounts of substances.

4- Gas chro.:
Is a specific method in which the moving phase is gas.

Active Constituents and the Drug Containing that are:
- Carbohydrates and related compound.
- Glycosides.
- Tannis.
- Lipids.
- Volatile oils.
- Resins and resins combination.
- Alkoloids.
- Hormones.
- Vitamins.
- Ehzymes.
- Proteins.
- Antibiotics.
- Biologics.
- Allergens.
- Poisonous plants.
- Pesticide.
Carbohydrates

**Carbohydrates:-**
Are aldehyde or ketone alcohols containing:- carbon, Hydrogen, Oxygen.
In which hydrogen & oxygen are generally in the same ratio as Carbohydrate are the first product formed in photosynthesis.

**Classification of carb.:**

**A- Simple carb.:**
1. Hexoses or monosaccharides: which are six carbon atoms.  
   \{C_6H_{12}O_6\}.
2. Disaccharide: Those have twelve carbon atom.  
   \{C_{12}H_{22}O_{11}\}.
3. Trisaccharides: Those have eighteen carbon atom.  
   \{C_{18}H_{32}O_{16}\}.

Such simple carb. Because of their solubility and sweet taste, are commonly referred to as: **sugar**

**B- Polysaccharides:**
More complex high molecular weight represented by: Starch, inulin, cellulose. 
This poly usually hydrolyzed to a component hexose and therefore called **hexosans:**

Starch which yield glucose is known as: a glucosan, and inulin yielding fructose is known as fructosan.

Sugar & starch are important products in the economy of mankind. They are extensively used as food & pharmaceuticals.

The plants also builds its structural skeleton from carbohydrate material such as: - Cellulose
- Gums
- Mucilage
- Pectins.

Which are an important group of drug both from the pharmaceutical as well as the therapeutic.

**Sugar:**
Are simple carb. And since they posses a characteristic sweet taste, the term "Saccharide" has been employed as a basis for the classification of this entire carbohydrate group.
The monosaccharides include the Hexoses which are simple sugar are having the formula \( \{C_6H_{12}O_6\} \)

The following sugar are official in the U.S pharmacopoeia:
Dextrose- Fructose- Glucose- Sucrose and lactose.
In addition other sugar have formerly been recognized as reagents:
Arabinose, Galactose, Maltose, Rhamnose, xylose.

**Sucrose:**
Is a sugar obtained from *saccharum officinarum* and other sources. It contains no added substances. Which is widely distributed in plants. It obtained from sugar cane and sugar beets and from various palms.

**Uses:**
Pharmaceutical necessity for syrups. It is also demulcent and a nutrient and to prevent oxidation in certain preparation of Iron and Bacteriostatic.

**Production of Sucrose (Sugar):**
The juice is obtained from sugar cane by crushing the stems between series of heavy iron rollers.
It is boiled with lime to Neutralize the plant acid, these acids would change the sucrose to invert sugar, and to coagulate albumin which rise to the top as a scum and are remove the juice by filtered.
Decolorized with sulfur dioxide, concentrated and crystallized.
The residual dark colored syrup is {Molasses}. Which extensively used in food, prepared animal foods and in manufacture of ethyl alcohol.
The sucrose which is present in sugar cane or beets stay as such without any change or hydrolysis because the absence of hydrolysis enzymes in this organ.
No absorption of sucrose in intestine before hydrolysis by invertase enzyme to glucose & fructose.

**Dextrose:**
Is a sugar usually obtained by the hydrolysis of starch.
It occurs naturally in:
Grapes and other fruits and may be obtained from hydrolysis of certain natural glycosides.
The scientific name glucose is employed in the chemical & biochemical literature.

**Uses:**
Dextrose is a food and may be given by mouth S.C., I.V., injection as required.
It is employed as a fluid and nutrient replenisher. It is also present in anticoagulant for the storage of whole blood, and used commercially in the manufacture:
Ice cream, canning industry, bakery products and candy.
**Glucose:**
Liquid glucose obtained by the incomplete hydrolysis of starch. It consists chiefly of dextrose with dextrin, maltose & water. Liquid glucose is usually made from corn starch. It is a colorless or yellowish, thick, sweet taste, syrup liquid nearly odorless.

**Uses:**
It is employed as a sweetening agent, as a substitute for sucrose in syrups and as an excipient for pills.

**Fructose:**
Which is called fruit sugar, and is obtained by the hydrolysis of sucrose, fructose is a ketone sugar which occurs naturally in most sweet fruits & in honey. Fructose is colorless crystals or a white crystalline or granular odorless powder that has a sweet taste. It is freely soluble in water.

**Uses:**
Used as a food for diabetics, infant feeding formula, and use also by injection (I.V.) with sodium chloride as a nutrient and electrolyte replenisher.

**Lactose:**
It is a sugar obtained from milk, it is also known as milk sugar. The sugar is crystalline from the whey obtained in cheese manufacture. Cow milk contains about 5% of lactose, upon hydrolyzed lactose yields: "Glucose and galactose" by lactase enzyme.

**Uses:**
It is used as a nutrient in infants food and as a tablet diluent.

**Honey**
Is a saccharine secretion deposited in the honey comb by the bee. The bees produce both the honey & wax.
It is a thick syrup liquid of a light yellowish to reddish brown color. It is translucent when fresh but often becomes opaque and granular due to crystallized dextrose. It has a characteristic odor, taste depend upon the source of product.

**Constituents:**
It is a mixture of dextrose & fructose known as invert sugar (50-90%) and water. Honey also contain about (0.1% - 10%) of sucrose and small quantities of dextrin, volatile oil, formic acid.

**Uses:**
It possesses nutrient and demulcent properties, laxative and pill excipient.
Polysaccharides

**Starch:**
It is produced in large quantities in green leaves as the temporary storage form of photosynthesis product. It occurs in seeds, stems and roots of perennials. It constitute from 50- 65% of dry weight of cereal seeds and about 80% of dry matter of potato tubers.

**Source:** Corn, Rice, Wheat, Potato.
Starch is a mixture of two different polysaccharides:
1. Amylose (is more soluble in water).
2. Amylopectin (less soluble).

-Starch: have ratio of Amylose 25% and Amylopectin 75%.

-Starch: hydrolyzed by amylase enzyme which is present in pancreatic juice and saliva which give rise $\rightarrow$ glucose & maltose.

-Starch: react with iodine to form:
Deep- blue (Amylose).
Blue- violet or purple color (Amylopectin).

**Corn starch (Amylose)**

**Preparation:**
Corn grains are softened by kept for about (40) hours in warm water containing enough sulfur dioxide to prevent fermentation after that passed through attrition mills which loosen the hulls (قشرة) and break the endosperm. The endosperm is further broken in burrstone mills, and the fine starch, gluten, hulls are removed by filtration and washed by cold water then starch settles to the bottom and then dried.

**Uses:**
Used as dusting powder, diluent for powder Nutrient, protective, absorbent properties, and for liquid glucose (corn syrup)$\rightarrow$ {dextrose and dextrins}.

**Inulin:**
It obtained by immersing the fresh rhizome or root in alcohol for some item.

**Uses:**
In culture media as a fermentative identifying agent for certain bacteria, and evaluation of renal function.
**Gums:**
Are natural plant hydrocolloids which may be as an ionic or non-ionic polysaccharides or salt of polysaccharides. They are translucent amorphous substances usually produced by plant as a protective after injury. When hydrolyzed yield large proportion of sugar.

**Mucilage:**
Are generally sulfuric acid esters which is a complex polysaccharide. Both gums & mucilage are generally considered as decomposition products of cellulose. The composition and function of gums and mucilage are closely related to hemicellulose expect that the principle sugar produced by \{G & M\} are galactose and arabinose where hemicellulose are: glucose, mannose, xylose. It is present in: salap roots (السحمب), fenugreek (الحمبة), seed and linseed.

**Uses:**
Laxative, culture media, emulsion.

<table>
<thead>
<tr>
<th>Gums</th>
<th>Mucilage</th>
</tr>
</thead>
<tbody>
<tr>
<td>dissolve in water</td>
<td>not dissolve (slimy)</td>
</tr>
<tr>
<td>pathological product</td>
<td>physiological product</td>
</tr>
</tbody>
</table>

- **pectin** -
Is a purified carbohydrate product obtained from the dilute acid extract of the inner portion of citrus fruits.

It is present in fruits insoluble form known as \{Protopectin\}, it is converted to the soluble form by heating the fruit with dilute acid.

This solution of pectin can be precipitated by alcohol or by salting out, then washed and dried.

Pectin occurs as a coarse or fine powder, yellowish white in color, almost odorless. It is completely soluble in 20 parts of water, the solution being viscous, colloidal.

**Uses:**
Is classified as a protective, it has the property of "conjugating toxin" and enhancing the physiologic function of the digestive tract through its physical, chemical and antibacterial properties specially to "ulcer".
Glycosides

Are compounds that yield upon hydrolysis one or more sugars, the most frequently occurring sugar is glucose which is called glycoside and other sugars are found such as: rhamnose, maltote.
- The non sugar component is known as the (Aglycone)
- The sugar component is called the (glycone)

Glycosides play an important role in the life of the plant involving it is regulatory, protective and sanitary functions.

Among such a wide variety of compounds one would expect to find many the therapeutic active agents like:
- cardiac stimulant
- laxative
- expectorant
- local irritant

أشباه السكريات الخام في حد ذاتها ليس لها تأثير علاجي ولكن مركباتها الناتجة من تحللها تمتلك هذا التأثير العلاجي.

(Classification of glycoside)
1- Cardio active group
2- Anthraquinone group
3- Saponin group
4- Cyanophore group
5- Thiocyanate group
6- Flavanol group
7- Alcohol group
8- Aldehyde group
9- Lactone group
10- Phenol group

-(Cardio active group)-

The members of this group are characterized by their highly specific action on: cardiac muscle, increasing tone, excitability and contractility. The better known cardio active gly:-

1-Digitalis or foxglove.

Is the dried leaf of digitalis purpurea linne. The plant is biennial herb, probably indigenous to Europe and United State and Canada. The powder form is dried the plant of temperature not exceeding 60c°.
Constituents:
- digitoxin \( \{0.2 – 0.3 \%\} \)
- digitalin
- gitalin
- gitoxin
and saponin, volatile oil, small quantity of tannic acid, total ash \( (7 - 12\%) \).

USES:
- powdered digitalis is (a cardio tonic) it increase the contractility and improved the tone of the cardiac muscle.
- stimulates the vagus center which tends to diminish the cardiac tone and excitability.
- The drug tends to improve renal secretion (diuretic), relieve edema.

DOSE:
Usual dose:
Initial 1.5 Gm divided over 24 to 84 hours maintenance \( (100 – 200)\)mg.

2 – Squill - بصل العنصل

Consist of the cut and dried fleshy inner scales of the bulb of Urginea maritima Known in commerce as:
White or Mediterranean Squill.

Constituents:
1- Scillaren “A”:
is crystal line upon hydrolysis it yield \( \rightarrow \) scillaridin A and disaccharide.
Which also hydrolysis in to glucose and rhamnose.

2- Scillaren “B”:
amorphous easily soluble in water and upon hydrolysis yield:
scilleridin B.

Uses:
Was classed as an expectorant, but it possesses emetic, cardio tonic and diuretic properties.

Dose:
Usual dose \( (100mg) \)
Ex: senodin, sedatussin.

3- strophan thus ……..? Other plants.
2-Anthroquinone Glycosides-

a number of gly related of this group such as :
1- Cascara sagrada
2- Frangula
3- Aloe
4- Rhubarb
5- Senna

These drugs are employed as cathartics but it contain an emetic principle in the fresh

- cascara sagrada -

It is the dried bark of Rhamnus pwsiana, it should be collected for at least one year before being used in medicinal preparation. The plant is a tree at the height of 10 meters indigenous of North America. Collect are made during the summer.

**Constituents:**

Two type of anthracene compounds:
1- emodin →10 -20 %
2- a loin →80 – 90 %
cascara contain not more than 4% of foreign organic matter and gives a red color when treated with ammonia.

**Uses:**

It is a cathartic, it is used in the correction of habitual constipation as {laxative} and also restores natural tone to the colon.

**Dose:**

- Fluid extract {Bitter cascara} is 1ml of aromatic cascara.
- Sweat cascara is 5ml.

"Aloe"

Is the dried juice of the leaves of Aloe perryi Baker known in commerce as "socotrin Aloe"

There are about (150) species of aloe, which is (exophytytic) plant, with freshly leaves, usually having spines at the spines of the margins. It is perennial herb which have about (20) leaves from (30 to 40 cm) long and (5-7 cm) of the base.
The leaves are cut and the juice from the cut end is allowed to drip in to clean gasoline cans where it evaporates spontaneously.

**Constit:**
- Socaloin 7.5-10 %.
- Barbolin 5-30 % {aloin}
or Capaloin 4.5-9 %.
  ↓
{It is a pale yellow volatile oil}.  
- Resinous material 16-63 %.

**Uses:**  
1. Cathartic properties, acting chiefly on the large intestine.  
2. Fresh juice use in treatment of:  
   - Burns  
   - Abrasions and other skin irritation.  
**Dose:** 250 mg.

"**Rhubarb**"

Consist of dried rhizome and root of:  
*Rheum officinale*  
The root are collected in Autumn from plant that are (8-10) year old, and dried either in the sun or by artificial heat.  

**Constit:**  
- Rhein.  
- Chrysophanol.  
- Emodin, aloe-emodin.  
- Gallic acid and catechin.  

**Uses:**  
- Cathartic (spongy in texture).  
- Also possesses astringent properties.  
**Dose:** 1 gm.

"**Senna**"

Dried leaflet of *Cassia Acutifolia*.  
The name is from sena, the native avabion name of drug. The plant are law branching shrubs, growing near the Nile river.
The plant cutting off of the tops about 6 inches above the ground and drying them in the sun.

**Constit:** {Sennosides A and B}

**Dose:** 2gm.

### 3-Saponin Gly

This group of Gly is widely distributed in the higher plants, characterized by forming colloidal solutions in water, leading to foam upon shaking. They have (a bitter مر, acrid-taste لاذع) and irritating to the mucous membrane. They destroy red blood carpuscles by hemolysis and toxic as (Fish - poisons). Upon hydrolysis they yield an aglycone known as a (Sapogenin).

The plant containing saponins for industrial purposes are:

- Quillaja قشرة الكوي
- Senega
- Sarsaparilla
- Gly cerrhiza (Liquorice) عرق السوس

{many attempt to discover precursors مصدر for cortisone from this plant}

### Gly cerryrhiza (Liquorice)

Is the dried rhizome and roots of glycyrrhiza glabra. Which is yielding a yellow and sweet wood, the plant is aperenial herb, 1-17meters in height, the under ground portion consist of several horizontal rhizomes bearing buds and of branching roots which penetrate the soil to a depth of several feet. Turkey, Greece, Asia, supply most of the liquorice.

**Constituents:**

It contain the sweet principle glycyrrhizin which hydrolysis to form:

1- glycyrrhetinic acid.
2- glycyramarin (bitter principle).
3- asparagin.
4- sucrose.
5- yellow coloring matter.

Gly. Posses an estrogenic action similar to estradiol.
Uses:
- demulcent .
- expectorant .
- flavoring agent which is employed to mash the taste of bitter drugs, such as : aloe, ammonium chloride, ........etc.

commercially :
Is added to chewing gums, chosalate candy, cigarettes, smoking mixtures .

4- Cyanophore gly

This group is represented by Amygdalin which commonly found in rosaceous plants. Such as:
- Bitter almonds. اللوز المر
- Kernels apricots. بذور المشمش
- Cherries. الكرز
- Peaches. الخبر
- Plums. العنب

Amygdalin upon hydrolysis yield
↓
Mandelonitrile which break down to form
↓
1- Benzaldehyde.
2- Hydrocyanic acid.
↓
Which is a principal in this group.

Uses: Sedative, expectorant, flavored cherry.

5- Thiocyanate gly

The seeds of several cruciferous plants contain glycosides, the aglycones of which are :
- Thiocyanates.

The principal of these glycoside are:
- Sinigrin from black mustard.
- Sinalbin from white mustard.
When hydrolyzed by enzyme Myrosin they yield mustard oil. {Fixed oil & volatile oil}.

**Black mustard**

Is the dried ripe seed of varieties of *Brassica nigra* the plant is annual herbs having slender erect stem yellow flowers.

**Constituents:** Black mustard contains fixed oil 30-35% it principal const. is Sinigrin which is accompanid by the enzyme myrosin as:

\[
\text{Sinigrin + myrosin} \rightarrow \text{Auyliso thiocynate + pot. acid. Sulfate} + \text{Glucose} \downarrow
\]

(Mustard oil)

**Uses:**
- Local irritant.
- Emetic.
- Externally as rubefacient محرض مدمج & Vesicant محشر.
It is applied to the skin as mustard plaster.
- Commercially as condiment.

**Dose:** 10gm.

**6- Flavonol gly**

The gly related to this group are:
1- Hesperidin → citrus peel, peppermint.
2- Rutin → Buck wheat, citrus fruit, Eucalyptus.
3- Quecetrinc. البقدونس

**Uses:**
Prolong the action of epinephrine and decrease the permeability of the cutaneous capillaries as: capillary antihemorrhagic, and considered as vitamin “p” factor, which is used in scurvy الاسقربوط, and in treatment of (x-ray), hematurea الدموي, Habitual abortion, Shock, Thrombopenia قلة التخثر (قلة الصفائح) التبول, influenza, rhumatizem, threatened abortion.

**Doses:**
20 mg → Rutin.
100 mg → Hesperidin.
7- Alcohol glycosides

This group present in:
. Oak, willow, poplar

Which include:
1- Salicin.
2- Populin.
3- Coniferin.
4- Arbutin.

Salicin which hydrolysis by Emulsin enzyme in the body into:
Active const. Saligenin (salicyl alcohol)

↓

In human system

Uses:
Antirheumatic properties and urinary antiseptic, astringent, diuretic.

Dose: 1 gm.

8- Aldehyde gly

Which is present in vanilla beaus, the plants are perennial, climbing attached to trunks of trees by means of rootlets.
Vanilla is an official drug having an aldehydic aglycone.
“Vinillin” is the aglycone develops during the caring of vanilla beaus.

Uses:
Tincture for flavoring agent and as pharmaceutical necessary as an Ingredient in acacia syrup.

9- Lactone gly

Which is widely distributed in (sweet clover) plant, which is found in Amazon in the fruits & seed of the plant.
Active const.: “Coumarin” → sweet clover.

Uses:
Flavoring agent, diuretic, respiratory disease.

2- Santonin
Which is found in the dried flower head of (Artemisia cina) plant.

Uses:
An the lmintics (ascaris).

3- Cantharides
Which are the dried insects (Spanish flies, Russian flies) the insect killed by plunging them in to dilute vinegar or expose to ammonia or sulfur dioxide.

Const: Cantheridin, Cantheridic acid.

Uses:
Irritant, vesicant, rubefacient, which used in veterinary medicine.

10- Phenol gly

Which include:
} which yields عنب الدب- Arbutin → found in {Uva ursi
hydroquinone upon hydrolysis.
- Hesperidin → found in {citrus fruits}.

Uses: As diuretic & astringent.

Other glycoside
Khellin

Which is obtained from the fruit of Ammi visnaga
the plant grows in Mediterranean countries.
**Uses:**
Urethral spasm, renal colic, coronary vasodilator, bronchodilator.  
{Bronchial asthma}, {angina pectoris}.

**Dose:** 50-100 mg 3 time daily.

**ALKALOID**

Alkaloid occurs in plants, some are found in animals and some reproduced in laboratory and also present in fungi (ergot). Alkaloid may occur in various parts of plants:

- In seeds → nux vomica.
- In fruits → black pepper.
- In leaves → belladonna.
- In under ground stems → sanguinaria.
- In roots and rhizomes → Ipecac.
- In park → cinchona.

The name of alkaloid is obtained in various ways:

1- From generic name of the plant yielding them like (Atropine → atropa belladonna).
2- From the specific name of the plant yielding them: (Cocaine → coca).
3- From the common name of the drug yielding them: (Ergot → ergotamine).
4- From their physiological activity: (Emetine, morphine).
5- From the discoverer.

Alkaloids react with acids to form salts which are usually freely soluble in water and not soluble in inorganic solvents.
Free alkaloids are usually soluble in ether or chloroform or other relatively non polar solvents, (organic solvent) → by this mean can isolation and purification of alkaloids as well as for quantitative estimation.
Alkaloids are crystalline solid, although a few are amorphous and some which lack oxygen in their molecules liquids like (Nicotine).
Classification of alkaloids

1- Pyridine and piperidine group.
2- Tropane group.
3- Quinoline group.
4- Isoquinoline group.
5- Indole group.
6- Imidazole group.
7- Purine group.
8- Lupinane group.
9- Steroidal group.
10- Amine alkaloid group.

1- Pyridine and piperidine group
This group includes the most important biological alkaloid which play an important group in different metabolic processes.
The important grude drugs which include this alkaloid are:
   1- Areca Nut.جوزة الفوفل
   2- Lobeliaوسق اللىبٍا (التبٍٍ الهّذي).ورق اللوبيا (التنبغ الهندي).
   3- Coniumثمرة الشوكران

**Areca Nut**
Is the dried ripe seed of areca Catechu.ويه بذور ناضجها تعود للعائله النخلية ويطلق على العصير الخارجي: Catechu
Catechu: Is an astringent extract or juice named in Indian which is a beautiful tall palm.

**Active constituents:**
   1- Arecaidine
   2- Arecoline
   3- Tannin- lipids -vol. oil-gums.

**Uses:**
Antihelmintic in veterinary practice.

**Dose:**
Dog → 2-4 Gm.
Sheep → 4-8 Gm. {according to B.W.}. 
2- Tropane Alkaloid group.

The most important in this group are:
1- Belladonna leaf – Belladonna root
2- Stramoium
3- Hyoscyamus
4- Coca and cocaine.

1- Belladonna نبات ست الحسن

Consist of the dried leaf and flowering or fruiting top of atropa belladonna or from dried root.

The mean is Italian which means
Bella → beautiful
Donna → lady.

The juice placed in the eyes cause dilation of the pupils thus giving a striking appearance.
The plant about (1) meter in height is aperenial herb, found :-
1- Europe.
2- Asia.
3- England.
4- Indian.

The leaves 5-25 cm in length 4-6 cm breadth

All parts of the belladonna, or nightshade من العائلة البذنجانية, Atropa belladonna, are poisonous. The drug atropine, used to dilate the pupils of the eyes, is one of several narcotics extracted from its leaves and roots.

Active constituents:
Both root and leaf yield alkaloid range about 1% which is ¾ is hyoscymamine remainder ¼ is atropine.
Uses:
Stimulant to the C.N.S. these effect being followed by depression, it decreases the secretion of:
   1- Saliva.
   2- Milk.
   3- Sweat.

It has sedative effect on the movement of:
   1- Stomach.
   2- Intestine.
   3- Uterus.
   4- Bladder.

It dilates the pupil. Thus it has the properties: Aparasymphatholytic, Astimulant, Anarcotic a sedative, An anodyne, amydriatic.

Dose:
Tincture belladonna is an anticholinergies usual dose: 0.6 ml.

Hyoscyamin: نبات السكران المصري
Is the dried leaf and flowering, fruiting top of Hyoscyamin higher plant. The plant contain the most important:

Hyoscyamin and scopolam

The plant is an annual or biennial heb indigenous to Europe, Asia, Northern Africa. The leaves should be gathered when the plant is in full flower and immediately be carefully dried.

Chief constituents:
The alkaloid Hyoscyamin and scopolamine 0.05 to 0.15% of which ¾ is Hyoscyamin.

Hyoscyamus:
Is parasympatholytic. (inhibitor). But the crude drug is rarely employed in medicine today.

**Dose:**
200 mg.

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**Stramonium**

as the same as in Hyoscyamus which the chief const. are: hyoscyamine and scopolamine.

**Dose:**
75 mg it effect on a parasympatholytic.

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**4- Quinoline alkaloid group:**

*Cinchona* and its alkaloid are the only therapeutically important members of this group. Which is the dried bark of the stem or the root of cinchona succirubra.

The plant are tree about 3000 feet in elevation indigenous in Ecuador, Peru, Indonesia, India.

Known in commerce as: red cinchona.

**Active constituents:**

1- Quinine.
2- Quinindine.
3- Cinchonine.
4- Cinchonidine.

**Uses:**

It possesses febrifuge properties, it have been used in the treatment of malaria fever for many years.

**Over dose** over dose of cinchona products resulting temporary loss of hearing and impaired sight.

**Dose:**
1 gm.
4- Isoquinolin alkaid group

It occur in a considerable number of alkaloid in widely separated plant families. The most important alkaloid are:

1- Hydrastis.
2- Ipecac.
3- Curare
4- Opium.

Ipecac:

Cousist of dried rhizome and roots of Cephaelis Ipecac unha it means (a creaping plant that causes vomiting).

The plant are low stragling shrubr with slender rhizomes bearing annulated wiry roots.
It has been cultivated in Malaysia and in India.

Active const:

Ipecac contain five alkaloids (2 – 2.5 %)
The three principal alkaloids are:
1- emetine
2- cephaneline
3- psychotrine

Contained chiefly in the bark which makes up about 90 % of the drug.
Ipecac content (2%) — 1/3 cephanelive and 2/3 emetine

Uses and dose:
Emetine hydrochloride is an anti – amebie – ant- protozoan.

Dose:
1 mg subeutaneoup per kg . B .W. but not exceeding (60 mg).

Curare:
Is acrude dried extract from the bark and stern of stryehnos castellan.
The term curare am Indian words for poison.

Active const:
Tubocurarine.
Uses:
- Tubocurarine chloride employed as askeleted muscle relaxant in surgery with out deep anesthesia.
- used to control convulsions of strychnine poisoning of tetanus.
- Diagnostic aid in myasthenia gravis.

Dose:
I.V 6-9 mg in 30-90 seconds followed in 5 minutes bg 3-5 mg.

Opium:
Is the air – dried miltky exudates obtained by incising the unripe capsules of:
Papaver somniferous linne.
The term opium meaning poppy juice.
The opium poppy an annual herb with large showy, flowers varyige incolor from white to pink or purple.
The color of seeds is also variable.
The plant is native to Asia, India, Iran, Macedoma. commercially produced now in turkey.

Active const:
More than 25 different alkaloide have been obtained from opium and its extracts such of:
1- morphine 4 – 21 %
2- codeine 0.8 – 2.5 %
3- hoscapine 4 – 8 %
4- papaverine 0.5 – 2.5 %
5- the baine 0.5 – 2 %
Harceine – protopine – codamine – etc.

Uses:
It acts chiefly upon C.N.S it action first stimulating the depressing here response.
1- Analgesic
2- hypnotic
3- Narcotic
4- Cow act the pupil of the eye.
Dose : 60 mg .

5 . INdole Alkaloids
A number of important alkaloids possess an indole ring as part of their structure such as:

1- Nux Vomica —> strychnine and brucine
2- physostigma —> physostigmine
3- Rauwolfia .
4- Ergot .

**Nux vomica :**
Is the dried ripe seed of strychnos Nux – vomica strychnose is the greek name a number of poisonous plants . it means a ' nut that cause vomiting the plant is as mall tree about 12 meters tall Native to East India and Ceylon , the fruit is a berry with 3 seeds.

**Active const :**
- Strychnine 1.5 – 5 % .
- brucine .

**Uses : Strychnine**
Is a valuable tool in physiological and neuroautomtical research it is extremely toxic .
Functioning as a central stimulant .
Fatal poisoning in humen being result from dose of 60 – 90 mg . the drug 4 seldom employed in modern medical practice , but is utilized of "avermin killer "

**Brucine :**
Which is less toxic strgchnine and is used commereially as an alcohol denaturant .

" Physostigma : calabar Bean "

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Is the dried ripe seed of physostigma venenata. It means full of poison.

The seed coat is brown, red, hard, thick, smooth but rough near the groove.

**Active const:**
1. Phystostigmine (serine).
2. Eseramine
   - Geneserine
   - Physovenine.

**Uses:**
Is classified as: Cholinergic (ophthalmic) for external use only. It is applied topically as 0.25% ointment conjunctive up to 4 times a day, to produce myosis.

Rauwolfia serpentina
Is the dried root of Rauwolfia serpentina is an erect shrub up to one meter high with cylindrical stems bearing pale bayk.

**Active const:**
- Reserpine pine
- Rescinnamine
- Deserpidine

**Uses:**
Is a hypotensive and sedative activity.

**Dose:**
Oral or parenteral 0.25 – 1 mg daily in 2 – 3 divided dose.

6- Imidazole Alkaloids
Pilocarpus and pilocarpine are the important drugs of this group.
Pilocarpus or jaborandi
Consisted of the leaflets Pilocarpus plant the planted are shrubs indigenous to barazid all the commercial kinds of pilocarpine.

**Uses:**
Classified as cholinergic (ophthalmic) drugs for external use.

**Dose:**

O. L ml of 0.5 – 3% solution to conjunctiva 1-6 times a day to produce myosis.

An ophthalmic ointment employed in glaucoma.

7- Steroidal alkaloids'
The important drugs and their alkaloid of this group are:
Veratrum Viride Veratrum album, Aconite ……
It consists the dried rhizome and roots of veratrum viride. The plant is found growing in wet mountainous sections of New England and U.S.A.

9- AlkaloidAL Amines
The drugs and their Alkaloids classified Alkaloidal amines are.
Ephedrine, Ephedrine, Colchicum seed colchicines.

**Ephedrine:**
Us the entire plant or the overground portion of Ephedra sisca.
It has used as a medicine in China for more than five thousand years.

**Uses:**
Ephedrine classed as sympathomimetic, it excites sympathetic nervous system depressing smooth and cardiac muscle action causes mydriasis and diminishes hyperemia.

**Dose:** 0.5 – 2% oil spray.

10- Purine bases
The drug of their group are
Coffee, caffeine, Theophline, cocoa, theobromine cola it yield not less than 1% caffeine.

**Uses:**
Kola possesses the central stimulating action of caffeine. It is an ingredient in several carbonated beverages.
Caffeine:
Occurs in coffee, tea, cacao, as well as kola. Caffeine can be produced synthetically usually prepared from tea, tea dust.

Uses:
Stimulus central nervous system

Usual dose:
Caffeine 200 mg
Or citrated caffeine 300 mg
Im or S.c

Theophylline: thea or Tea consist of the prepared leaves and leaf – buds.
There are: Green tea and black tea.
Uses:
Relaxants on smooth muscle, diuretic properties
Dose: 200 mg.

-Volatile Oil-

Are found in various plant parts. Because they evaporate when exposed to the air at ordinary temperatures. They are called:
- volatile oils.
- Ethereal oils.
- Essential oils.
which are colorless when freshly obtained but on long time become darkening in color.

- To prevent this they should be stored in cool, dry place in tightly stoppered glass containers.
- Volatile oil may occur in secretory structures or in parancluyma cell or leaves such as: Eucalyptus.

**Properties:**
Volatile oil are immiscible with water, but they are sufficiently soluble to impart their odor to water.
It is soluble in ether-alcohol and most organic solvents.

**Differentiation between**

-Volatile oil and Fixed oil -
volatile oil are:
1- Distilled from their natural sources.
2- They don't consist of gyceryl ester of fatty acids.
3- They don't leave a permanent grease spot on paper.
4- Don't rancid as fixed oils if don't expose to air or light

-**Methods obtaining volatile oil**-

vol. oil are usually obtained by distillation of the plant parts containing the oil.

Three types of distillation are used:
1- water distillation.
2- water and steam distillation.
3- direct steam distillation.

**Water distillation:**
Is applied to plant material that is dried not subject to injury by boiling ex:
Turpentine oil is obtained in this manner.

(تستعمل هذه الطريقة في حالة عدم تأثر النبات بالحرارة).

**2- water & steam distillation:**
Is employed for substances {either dried or fresh}. that may be injured by boiling in case of dried material {cinnamon, clove}.

The plant is grinding and then covered with a layer of water and steam is passed through the macerated mixture.
Since the oil might be impaired by direct boiling, the steam is generated elsewhere and is piped into the container holding the drug, the oily layer separated from the aqueous layer.

3- **Direct steam distillation:**
Is applied to fresh plant drugs {peppermint oil} the plant is cut and taken directly to the distilling chamber, steam is forced through the fresh herb carrying the oil droplets to the condensing chamber.

**Classification of volatile oil**

1. Hydrocarbons volatile oil.
2. Alcohols volatile oil.
3. Aldehydes volatile oil.
5. Phenols volatile oil.
6. Phenolic ethers volatile oil.
7. Oxides volatile oil.
8. Esters volatile oil.

**1- Hydrocarbon vol. oil:**
Occur in practically all vol. oil ex: {black pepper, turpentine oil}.

**Turpentine oil:**
Is the volatile oil distilled from the "oleoresin" obtained from {pinus palustris} which yield. "terpene oil".

**Description:**
It is a colorless liquid having a characteristic odor and taste and become stronger when the oil is ages or is exposed to air.

**Uses:**
-Local irritant -mild antiseptic -employed in insecticides in the production of synthetic camphor expectorant -diuretic -urinary antiseptic and anthelmintic. furniture polish.

**Dose:** 0.3 ml
- Black Pepper -

Is the dried full-grown but unripe fruit of "piper nigrum". The plant is a woody, perennial climber, indigenous in: -China -India - Tropical countries.

**Constituent:**
- Phellandrene } volatile oil.
- Caryophylline} volatile oil.
- Piperine & piperidine and {resin, starch, tannin}.

**Uses:**
Commercially used as: -Condiment -Stimulant -Irritant
-a febrifuge -Stomach is Carminative.

2- Alcoholic vol. oil:

The important alcohol volatile oil drug are:
- Peppermint.
- Cardamon
- Rose oil
- Orange flower

"Peppermint oil"

Consist of the dried leaf & flowering top of **Mentha Piperta**. The plant is perennial herb.

**Constituent:**
- Volatile oil 1% → Menthol.
- Resin, Tannin.

**Uses:**
-Carminative -Flavor -Stimulant -Counter irritant

As a medicine it has been largely replaced by peppermint oil, as "a menthol" in ointment.

**Cardamon:**
Is the dried ripe seed of *Elettaria Cardamomum* Cardamon seed should be recently removed from the capsules.
The plant is perennial herb, the fruits are collected mostly from October to December as they ripen they are Sun-dried,
bleached with Sulfur dioxide and collect the seed for the distillation of the oil.

**Constituent:**
The seed contain:
1- Volatile oil 3-6% {Terpene}.
2- Fixed oil 10%.
3- Starch.

**Uses:**
-Flavor -Aromatic stimulant -Carminative & Condiment.

**3-Aldehyde volatile oil:**
The aromatic Aldehyde include benzaldehyde ex:
- Bitter almond oil (اللوؤز المر).
- Cinnamon oil (الدارسيني).

**Cinnamon oil:**
Is the dried bark of cinnamomum cassis to {lauvaceae} family.
Cinnamon oil is the volatile oil distillated with steam from the twigs of: Cinnamomum cassia.
The cinnamon trees are {9 meters} in high. The bark is gathered from young trees usually under 6 years old.
Constituent:
- {2-6% volatile oil} → cinnamic aldehyde.
- Manitol → give sweet to the bark.
- Tannin.

Uses:
-Carminative -Flavors -Stimulant -Aromatic Rhubarb tincture - Antiseptic.

Dose: 0.1ml Carminative.

4- Ketone volatile oil
The important drugs of this class are:
- Camphor.
- Spearmint
- Caraway.
- Buchu.

Camphor
Is a ketone obtained from cinnamomum camphor The plant is a large ever green Tree.
Natural camphor occurs as a crystalline product in clefts in wood of stems & roots, and dissolved in the vol. Oil.
The wood is chipped & distilled with stem.
{1 pound of crude camphor is obtain from (20-40) pound of chips}.

Constituent:
Saturated ketone { C9H16CO }.

Uses:
Local antipruritic employed topically as 1-3% رضحوض on the skin.
- Stimulant -Antispasmodic.
- In certain plastics (commercially).
"Buchu"
Is the dried leaf of "Barosma betulina" the plant are low shrubs and the drug collected from the wild plants.

**Constituent:**
Contain volatile oil about:
1- 30% of diosphenol (buchu camphor).

↓

terpenes & dipentene

2- Diosmin (glycoside) which resemble hesperidin.

**Uses:**
Diuretic- Carminative- urinary antiseptic.

{The volatile oil is excreted by the kidneys rendering the urine slightly antiseptic}.

**Dose:** 2 gm.

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**5- Phenol volatile oil**
The phenols occurring in vol. Oil are of two types:
1- Those which are present naturally.
2- Those which are produced as the result of destructive distillation of certain plants products.
The most important drugs contain phenol volatile oil:

- زيت الزعتر - Thyme.
- زيت القرنفل - clove.
- زيت القطران - coal tar.

**Thyme oil:**
Consist of the dried leaves and flowering tops of "ThymusVulgaris".
Thyme yields not less than 1.5ml of volatile thyme oil from each"100 gm" of the drug.
The plant is small ever green shrub in Italy, Spain. The oil is colorless, yellow or red liquid with a characteristic pleasant odor.

**Constituent:**
- Thymol 25-40%.
- Carvacrol.
Uses:
- Flavor – Antiseptic – Antispasmodic – Anthelmintics - Antifungal

"Clove oil"
Obtain from dried steam (flowering) Eugenia Caryoplyus plant.
Clove oil contain: - Eugenol 85%.

Uses:
- Analgesic for teeth - Antiseptic - Carminative – Flavor.

له قيمة تجارية لإنتاج المادة العطرية (Vanillin).

6- Phenolic Ether volatile oil

The important drugs:
- **Anise oil:**

Is the dried ripe fruit of Pimpinella Anismum. The plant is an annual herb in: - Asia - Egypt - Greece - America.

**Constituent:**
volatile oil 1-3% consist:
- 80-90% anethole.
- Fixed oil.
- 3-4% calcium oxalate.

Uses:
- Stimulant - Carminative - Diuretic - Diaphoretic.

Anise fruits are used as flavor in certain type of bakery products.

7- Oxide volatile oil

Is found in Eucalyptus and several other volatile oil yielding drugs. **Eucalyptus oil:** Is the dried leaf of Eucalyptus Globulus.

**Constituent:** volatile oil 3-6%

- Eucalyptol (cincole) 70%.
The oil is colorless or pale yellow liquid.
Uses:

Dose: 0.5 ml.

8- Ester volatile oil

Ester occure in volatile oil which is formed by the reaction of alcohol with acid compound (acetic acid) which form aromatic esters.

The important drugs are:
- Bergamot oil.
- Winter Green oil.
- Mustard oil.

Bergamot oil:

Obtain by expression from the (rind) of the fresh fruit of citrus bergamia. The plant is small tree yielding fruits having a thick yellow rind from which the volatile oil is obtained.

Constituent: The oil contain esters as:
Linaly acetate 20-30%.

Uses: as - perfume- Hair tonics .

Winter Green oil:

Consist of the dried leaves of Gaultheria procumbens plant. Which contain the:
- Methyl Salicylate
Which also produce synthetically. It is yellow liquid or colorless.

Uses:
- Aromatic Cascara - Local irritant - Antiseptic - Antirheumatic - Flavor.