

PHARMACOGNOSY IN VARIOUS SYSTEM OF MEDICINE

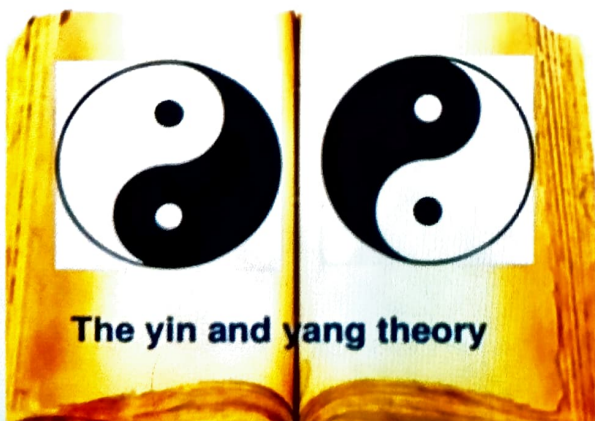
Contents to be covered in this topic

ROLE OF PHARMACOGNOSY IN ALLOPATHY

ROLE OF PHARMACOGNOSY IN TRADITIONAL SYSTEM OF MEDICINE



- Role of Pharmacognosy in Ayurveda
- Role of pharmacognosy in unani
- Siddha system of medicine
- Role of Pharmacognosy in Homeopathy
- Chinese system of medicine



The yin and yang theory

❑ ROLE OF PHARMACOGNOSY IN ALLOPATHY

- Allopathy is derived from the Greek word **allos** means “other or different” and **pathos** means **disease or suffering**.
- In combination, it means “other than the disease.”
- The term Allopathy was given by **Samuel Hahnemann** in the **early 19th century**
- Allopathy medicine is a part of the **Western medical system**.
- In this system, the drugs are manufactured using **synthetic chemicals** or chemicals derived from natural products like plants, animals, or mineral sources.
- Various drugs like **tablets, Capsule, injections, tonic**, etc. It also uses modern equipments for **diagnosis, analysis, and surgery**
- In this system, doctors treat a disease based on the symptoms not based on causes. This system is also known as **evidence-based or modern medicine**. The main drawback is most of the drugs have **side effects**.
- **Role of Pharmacognosy in Allopathy** is that **Natural products isolated from plants/animals/marine/mineral** acts as the major source for Modern Medicine. Ex: Taxol from Taxus, Digoxin from digitalis, morphine and codeine from opium, vincristine from vinca
- **Pharmacognosy** plays a **diverse role in the discovery, characterization, production, and standardization** of these drugs
- It is used by pharmaceutical companies to **screen, characterize and produce new drugs** for the treatment of multiple human diseases.
- Thus, natural compounds **provide excellent models to discover novel drugs**. **Digitalis**, the most important medicinal plant, is directly used in Allopathy medicine as cardioprotective action.



❑ ROLE OF PHARMACOGNOSY IN TRADITIONAL SYSTEM OF MEDICINE

❖ Role of Pharmacognosy in Ayurveda

- Ayurveda is an Upaveda of Atharvaveda
- Ayurveda is the dominant herbal tradition in India
- The oldest system of healing in the world.

✓ Definition

The term Ayurveda" is derived from two words, **Ayur** means life and **Veda** means knowledge or science Therefore Ayurveda means **science of life or way of life**

✓ Principle

- The principle of Ayurveda is based on the concept of **five basic elements and tridoshas**. According to Ayurveda, the whole universe made up of five basic elements (**Panchamahabuthas**) are **Akasha (ether)**, **Vayu (air)**, **Agni (fire)**, **Jala (water)**, **Prithvi (earth)**
- **Vata, pitta** and **kapha** together are called **Tridosha (three pillars of life)**
- **Tridosha** exist in human body in seven forms called **Saptadhatu** viz. **Rasa (lymph)**, **Rakta (blood)**, **meda (adipose tissue)**, **mamsa (flesh)**, **majja (nervine tissue)**, **Shukra (reproductive tissue)** and **asthi (bones)**.

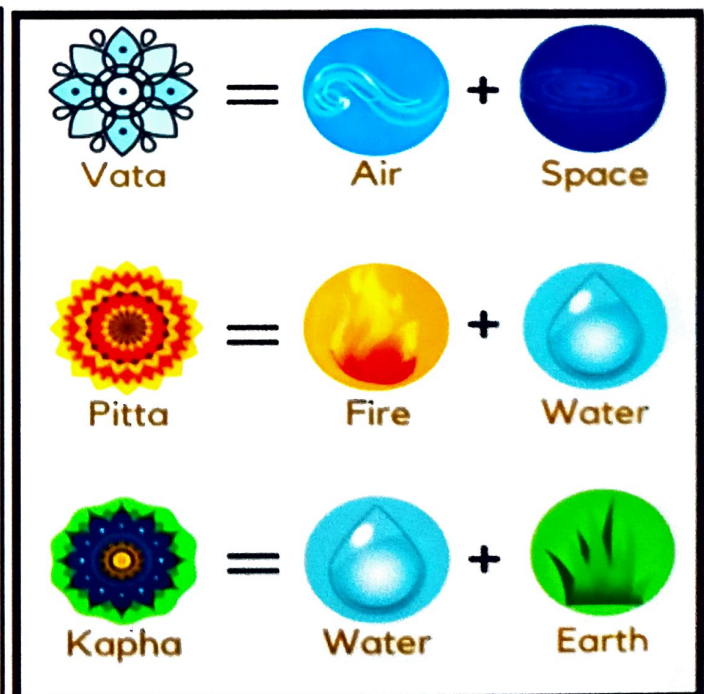
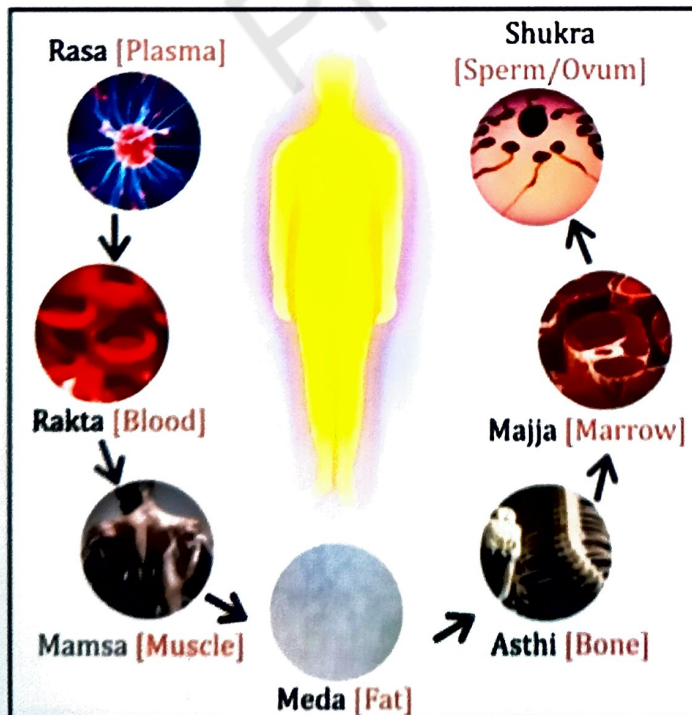
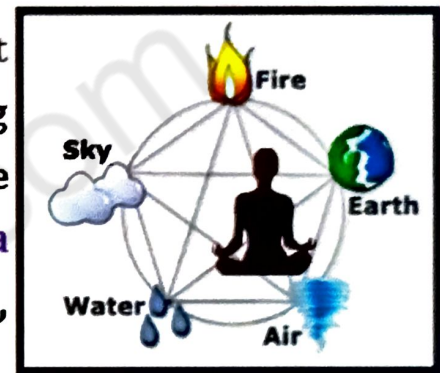


Fig. Tridosha and Panchamahabuthas

- When **tridosha, saptadhatu and mala** are in balance with each other, it is called as healthy condition while imbalance causes a pathological condition
- It is hypothesised that the five characters of the medicinal herbs viz. **rasa, guna, virya, vipak and prabhava** can be applied to **treat various pathological conditions.**
- The health or sickness depends on the **presence or absence of a balanced state of the total body matrix**

The properties, location and manifestations of these elements are as follows -

- **Ether** is non resistance, it is located in the body cavities like mouth, thorax, abdomen, lung cavity, digestive tract.
- **Air** is related to **movements, vibrations and oscillations.** They manifests **movement of muscles,** pulsation of heart, expansion and contraction of lungs, functioning of digestive and nervous systems.
- **Fire** concerned to radiation, it manifests digestion, **metabolism,** temperature, **vision** and intelligence
- **Water** is related to force and cohesion. Located in **cytoplasm, blood, salivary glands, gastric juice**
- Earth is concerned to **resistance and solidarity.** They manifests skin, nails, hairs and bones.
- These elements manifest in the functioning of our scenes.

TRIDOSHAS - The five elements combine to form " Tri Doshas" i.e Vata, Pitta, and Kapha. They are the " Basic Forces" and also known as the " **Pillars of Life**" **Vata** (Air principle) the elements ether and air **Pitta** (Fire principle) the elements fire and water **Kapha** (Water principle) the elements earth and water

- According to the Ayurveda, sickness is due to the imbalance of any one or more of the three doshas.
- Eg Aggravation of **Pitta** leads to **indigestion, skin diseases and liver problems.**

✓ Factors

- Factors responsible for imbalance of doshas are **physical, mental, spiritual and environmental** may contribute for the imbalance of doshas

✓ Diagnosis

- Diagnosis is carried out to find out which **dosha is aggravated**. For this purpose, **nadi** (Pulse), **tongue, skin,** physical features, stool, urine etc are examined.

✓ Treatment

- The importance of treatment is to restore the balance and harmony of doshas with proper diet and drugs

✓ Selection of the drugs -

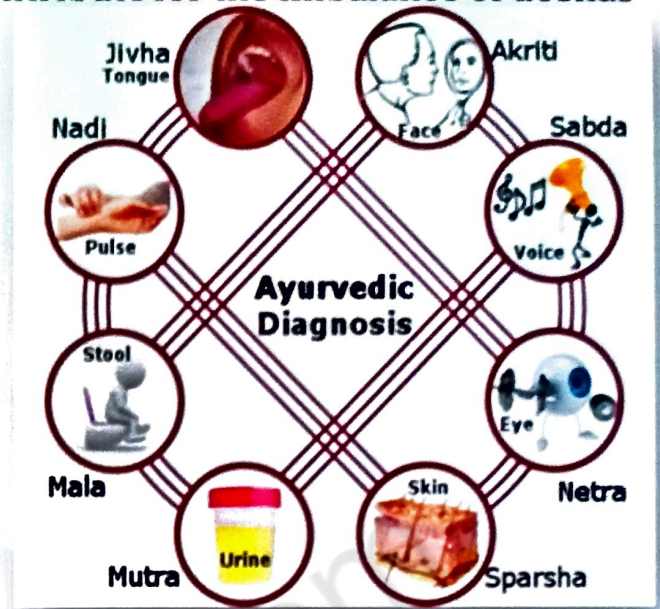
Based upon

1. **Rasa (Taste),** 2. **Virya (Potency)** and **Vipaka (Taste after digestion)**

RASA

- Rasa indicates the **composition, properties and and probable** action of the drugs
- Each taste has one or more mahabuthas (elements) and each taste has its own influence on doshas. There are **six taste**

E.g.-



TASTE	DESCRIPTION
Sweet (earth and water)	Influences on doshas. Kapha increases, vata and pitta decreases and promote antibiotic activities
Sour- (Water and fire)	Pitta increases- stimulates enzymes
Saline- (Fire and earth)	Pitta increases
Bitter (Air and fire)	Pitta increases
Pungent- (Air and ether)	Kapha and pitta decreases
Astringent- (Air and earth)	Pitta decreases and vatta increases

VIRYA

- On the basis of Virya, the drugs are classified into **hot and cold drugs**
- **Hot (Ushna) drugs** - Aggravates pitta and pacifies vata and kapha, garlic, drumstick
- **Cold (Sita) drugs** - Aggravates kapha and vatta and pacifies pitta, Jeera, amla

VIPAKA

- **Food and medicine** undergoes various changes during digestion (metabolism). The taste after digestion is known as vipaka

The three tastes described under vipaka, sweet, sour and pungent

- **Sweet** - Aggravates kapha and alleviates pitta and vatha
- **Sour** - Aggravates pitha and alleviates kapha and vatha
- **Pungent** - Aggravates vatha and alleviates kapha

❖ Role of pharmacognosy in unani

- Father of Unani medicine Hippocrates
- It was **introduced in India** by the **Arabs and Persians**
- Today, India is one of the leading countries in as far as the practice of Unani medicine is concerned.
- Also known as **Tibb-e-unani, Islamic, Oriental and Arab medicine**

✓ Origin & Development of Unani System

- **Hakim Ajmal Khan** is UNANI physician and also one of the foremost freedom fighters in the country.
- He established an **Ayurvedic and Unani Tibbia College and Hindustani dawakhana**

✓ Principles & Concepts

- **Based on two theories** → the **Hippocratic theory of four humours** (blood, phelgm, yellow bile and black bile)
- **Pythagorian theory of four proximate qualities** (states of living human body like **hot, cold, moist and dry**, represented as **earth, water, fire and air**)



The humour (put into a **good mood**) is also assigned **temperament** as -

1. Blood is hot and wet, Phlegm is cold and hot, Yellow bile is hot and dry and Black bile is cold and dry

2. Phlegm is cold and hot (Thick, sticky, stringy mucus secreted by the mucous membrane of the respiratory tract, as during a cold or other respiratory infection).

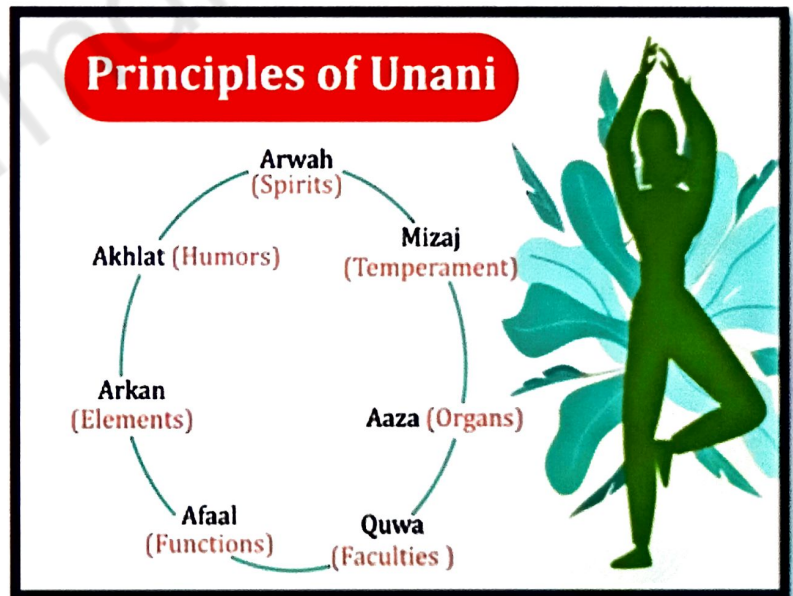
3. Yellow bile is hot and dry (A yellow, or greenish, viscid fluid, usually alkaline in reaction, secreted by the liver. It passes into the intestines, where it aids in the digestive)

4. Black bile is cold and dry (a humor that was once believed to be secreted by the kidneys or spleen and to cause sadness)



The human body is considered to be made up of the following seven components are:

- i. Elements (Arkan)
- ii. Temperament (Mizaj)
- iii. Humors (Akhlal)
- iv. Organs (Aaza)
- v. Spirits (Arwah)
- vi. Faculties (Quwa)
- vii. Functions (Afaal)



Elements (Arkan)

- The human body contains four elements (earth, air, water, fire)
- Each of the four elements has its own temperament as follows:
Air - Hot and Moist, Earth- Cold and Dry, Fire- Hot and Dry, Water - Cold and Moist

Temperament (Mizaj)

The individual's temperament is believed to be the result of the interaction of these four elements.

Humors (Akhlāt)

Humours are those moist and fluid parts of the body which are **produced after transformation and metabolism of the aliments**; they serve the **function of nutrition, growth and repair**; and produce energy.

Organs (Aza)

These are the various organs of the human body. The health or disease of each individual organ **affects the state of health** of the whole body.

Spirits (Arwah)

Ruh (Spirit) is a **gaseous substance**, obtained from the inspired air, it helps in all the metabolic activities of the body. It is the source of vitality for all the organs of the body.

Faculties (Quwa)

These are of three kinds: **Natural power (Quwa Tabiyah)**

- **Natural power** is the power of **metabolism and reproduction**.
- **Psychic power** refers to **nervous and psychic power**. It is located in side the brain and is responsible for **perceptive and motive power**.
- **Vital power (Quwa Haywaniyah)**
- Vital power is responsible for maintaining life and enables all the organs to accept the effect of psychic power.
- This component refers to the **movements and functions** of all the organs of the body
- In case of a healthy body the various organs are not only in proper shape but are also **performing their respective functions**

✓ Diagnosis

- Dependent on **observation and physical examination**.
- Diagnosis involves **investigating the causes of disease**



- For this, the physicians depend mainly on **pulse reading and examination of urine and stool**
- **Physical examination -**
Is carried out by the diagnosis of **urinogenital disorders, pathogenesis of blood** and other **humors, metabolic disorders and liver diseases.**

The following observations of urine are made:

- **Colour**
- **Consistency**
- **Odour**
- **Foam or froth**
- **Precipitates**

✓ **In this system disease is treated as follows :**

1.	Hajbil Tadbeer (Regimental therapy)	It includes venesection, diaphoresis, diuresis, Turkish bath, massage, cauterization, purging, emesis and exercise
2.	Hajbil Ghiza (Diettotherapy)	It deals to treat certain ailments by administration of specific diets or by regulating the quantity and quality of food
3.	Hajbil Dava (Pharmacotherapy)	It deals with the use of naturally occurring drug mostly herbal drugs

❖ **Siddha system of medicine**

- It is a belief that **Lord Shiva** unfolded the knowledge of medicine to his wife **Parvati** which was then passed to **Siddhars.**
- System of pre-vedic period identified with **Dravidian culture** and it is largely **therapeutic in nature**
- It is also based on **three humors** i.e. **vatta, pitta and kapha** & believes everything in universe is made up of **5 basic elements, earth, water, sky, fire and air**
- **Imbalanced** ratio of **panchamahabhutas** may cause disease

• **Predominance of triguna according to time in a day is as below-**

- 6.00 am to 10.00 am-Vata
- 10.00 am to 2.00 pm- Pitta
- 2.00 pm to 6.00 pm- Kapha

Vata Guna:

- **Characteristics** - stout, black, cold & inactive personality
- Increased vata develops flatulence, acidity, dysentery, obesity, etc
- Individuals show arrogant behaviour, partial paralysis, heart attack, neck & chest pain, etc.

Pitta Guna:

- **Characteristics** : lean, wheatish complexion, hot personality
- Increased pitta results in early greying of hairs, reddish eyes & more sexual desire
- Individuals suffer from anemia, burning chest, mental derangement, etc.

Kapha Guna:

- **Characteristics**: well build, good complexion, good behaved personality
- More affinity towards sweet food & sex
- Increased Kapha develops diseases like jaundice, heart attack, fever, anemia, etc.

✓ **Diagnosis**

Physician generally identifies of causative factors through exam. of **Nadi (pulse)**, **Dhwani (speech/voice)**, **Twaka (tongue)**, **Deiham (Body)**, **Malam (Feces and the status of digestive system)**, **Mutram (urine)**, **Vizhi (Eyes color)**

- If **pulse propagates to left side** it denotes **loss of self control** while **propagation to right side** shows **sign of death**.
- Voice with high sound shows **pitta & low sound denotes** low B.P.
- Tongue with boils shows **imbalance of vata**, sense of bitterness denotes pitta & white slimy tongue shows **low B.P.**



- Study of **color of fecal matter, urine & eyes gives idea of imbalance of triguna.**
 - **Darker color** indicates **vata**
 - **Greenish/ reddish color** indicates **pitta**
 - **Whitish color** shows **kapha**.

✓ **Treatment**

Treatment takes into account environment, age, sex, race, habits, mental status, habitat, diet, appetite, physical condition, physiological constitution, etc. Vaidya (Physician) has knowledge of herbs & their effectiveness in specific diseases

Types of formulations in Siddha System:

Groups	Example
Kashayam	For infants, Jaundice, piles
Churnam	Panchammruta, Kadukai, Ashwagandha.
Lehyam	Amla lehya, Ginger lehya, Coconut lehya
Tailam	Bhringamla, Amlahat, Nutmeg, Neem etc.
Bhasmam	Tortoise shell, Egg shell, Snake, Shrunga Bhasma
Chenduram	Rasa chendrum, Chendurams of Copper
Mezhugu	Kasturi wax, Saffron wax, Turmeric wax.
Ghrtam	Adhatoda Ghrta Brahmi Ghrta,
Tablets	Kasturi tablet, Saffron tablet

❖ **Role of Pharmacognosy in Homeopathy**

- The word "Homeopathy" is derived from two Greek words, **Homois** meaning **similar** and **pathos** meaning **suffering**.

✓ **History**

- The concept of **"Like cures like"** of homeopathy was first made by **Hippocrates about 400 B.C.**
- During the **15th to 16th centuries**, the Swiss physician and leading medical reformer, **Dr. Theophaustus Von Bombast (1493-1541)**,

- rejected the principle of opposite acting remedies and stated that same must be cured by same.
- 17th century, the first precise enunciation of the fundamental homeopathic principle was given by a Danish physician, Dr. George Stahl. He wrote "I am convinced that disease will yield to and be cured by remedies that produce similar affections"
- **1835-** 1st homeopathy medical college was opened in Allentown, Pennsylvania

Discovery Modern system of Homeopathy

- **Dr. Samuel Hahnemann**, Founder of modern Homeopathic treatment
- Born on 10th of April 1755 in the town of Meissen in Saxony (eastern Germany)
- Doctor of Medicine degree in 1779.
- Stated-there is exists a law in medicine which he called as "Law of Similar" and introduced a new principle called **similia similibus curantur** meaning like disease are cured by like medicine- **like be treated by likes**
- He gave the name- Homeopathy, which was came in print in 1807
- "Discovery of Like treats like" It was in the year 1790, when Dr. Hahnemann was going through a work of translating a book from English to German written by a distinguished Scottish physician, Dr. William Cullen "A treatise on Materia Medica".
- It was an account of a **drug-Cinchona or peruvian bark, which had been used for the treatment of malaria.**
- Homeopathy simply means **treating diseases with remedies, prescribed in minute doses**, which are **capable of producing symptoms similar to the disease** when they taken by the healthy people.

✓ **Fundamental principal of homoeopathy**

1. **Law of Similia**
2. **Law of Simplex**
3. **Law of Minimum**
4. **Doctrine of Drug proving**

5. Theory of Chronic disease

6. Theory of Vital force

7. Doctrine of Drug-dynamization

S. NO.	PRINCIPAL	DESCRIPTION
1	Concept of individualization	<ul style="list-style-type: none">• It stated that no two individuals in the world are alike and the disease affecting the two individual cannot be similar.• Although, a no. of individuals may possess the common symptoms, the individual response to the same disease would be different from person to person. thus the medicines used to cure some disease in different individual are different.
2	Principle of similar/law of similar	<ul style="list-style-type: none">• It stated that the treatment of a disease by a medicine which produces similar symptoms in the healthy individual.
3	Principle of simplex	<ul style="list-style-type: none">• This principle states the use of only single, simple medicine at one time
4	Principle of minimum dose	<ul style="list-style-type: none">• It stated that lower the dose of the medication, greater is its effectiveness• In Homeopathy, substances are diluted in a step-wise fashion and shaken vigorously after each dilution• This type of dilution process is known as Potentisation
5	Law of proving	<ul style="list-style-type: none">• The method used for determining which remedies were suitable for specific disease was called proving

6	Law of Dynamization and Dilution	<ul style="list-style-type: none"> • Dr. Hahnemann recognized that the use of substances that cause symptoms similar to an existing disease • Liquids are diluted with alcohol (ethanol), water, or alcohol/water mixtures, whereas insoluble powders are diluted with lactose (milk sugar).
7	Law of Vital force	<ul style="list-style-type: none"> • It stated that "Life" depends on an important and undetectable "Vital Force" which runs through the body known as Vitalism which if disturbed will lead to illness or disease. • Homeopathy medicine restores the vital energy balance and stimulates the body's own healing response.

✓ **Diagnosis**

- Homeopathy usually collect an extremely detailed case history. Patients are asked to describe their **medical history & current symptoms**

✓ **Treatment**

- The treatment is based on the concept of **proving and prover**

Prover - The healthy person

Proving The symptoms (Physical, mental, emotional changes) that are caused by the various potencies of medicines in prover.

- For the treatment, the symptoms of the drug are compared with the symptoms of the patient. In other words the selection of the drug depends upon the symptoms of the drug and patient condition

❖ **Chinese system of medicine**

- It is also ancient dated back to Yellow Emperor's classic of Internal Medicine (**Huang Di Nei Jing**)-200 BC & 100 AD.
- Based on the idea "all life is subject to natural laws"
- The hypothesis includes two "**yin and yang**" theory

- Says that everything in the universe consists of a dark (yin) and light side (yang).
- The five elements (i.e. water, metal, earth, fire and wood).
- They differ in diagnosis and treatment

2 Hypothesis :

- Yin(Dark) and Yang(Light) theory
- Five elements theory

Principles and Theory

Yin-Yang and Qi

- Traditional medicine revolves around the principles of **Yin and Yang** which are the opposites found in everything, such as **day (Yang) or night (Yin)**
- Practitioners believe that every person has a life force known as "Qi."
- The purpose of medicine is to establish a **balance of the body's Qi**

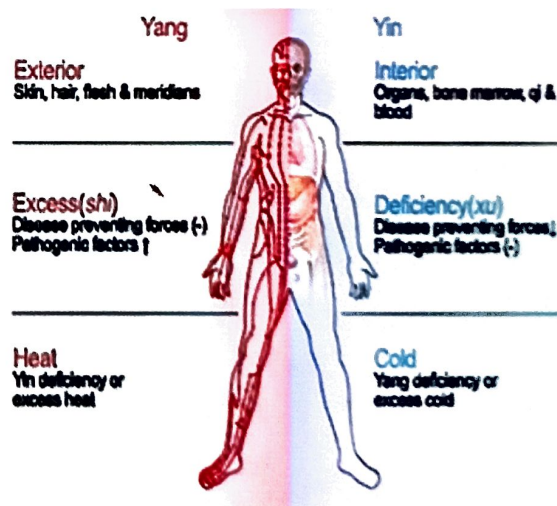


Five elements Theory -

- The five vital organs (the heart, liver, spleen, lungs, and kidneys) are each seen as corresponding to one of the five elements of **earth, wood, metal, fire and water**
- It is believed a pathological change in any of the vital organs will affect the health of the other organs

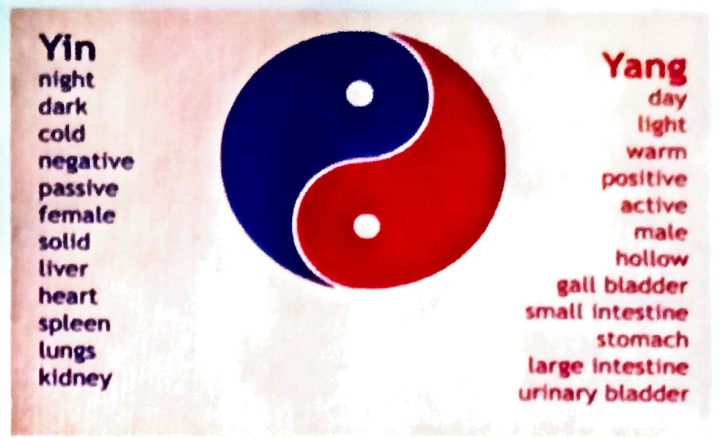
Doctrine of Yin and Yang

- "Yin" and "yang" originally referred to topographical inclines.
- "Yin" was defined as the **north face of a mountain**.
- Similarly, "Yang" was defined as the **south face of a mountain**.
- They classify parts of the **upper body is**
- **Yin and yang** are applied to medicine in numerous ways.
- The upperpart of body is **yang**, while the lower body is yin.
- When a person is healthy, these yin and yang aspects of the body are "in harmony". (**synchronization**)



✓ Treatments

- Herbalism
- Acupuncture
- Moxibustion
- Cupping
- Massage Therapy



Herbalism

- Chinese herbal medicine has been used by Chinese people to treat diseases for over 4,000 years.
- Herbs consists mainly of natural medicinal materials such as **plants, animal parts, and minerals** of medicinal value.



Acupuncture

Acupuncture involves the stimulation of anatomical points on the body with thin needled



Moxibustion

Moxibustion is a traditional Chinese medicine technique that involves the burning of mugwort, a small, spongy herb, to facilitate healing.



Cupping

Therapy is a form of CTM in which **cups are placed on the skin to create suction.**

The cups can be made of a variety of materials, including: Glass, Bamboo, Earthenware



Massage

Chinese massage is known as Tui Na • Uses wave-like motions to loosen joints and nourish muscles.



e.g.-shivering occurs due to excess of yin while excess of yang causes a fever.

The treatment is done with herbs polyherbs.

Ex. *Ephedra sinica*, *Rheum palmatum*, *Carthamus tinctorius*, *Clerodendron trichotomum*, *Panax ginseng* etc.

INTRODUCTION TO SECONDARY METABOLITE

Contents to be covered in this topic

DEFINATION, PROPERTIES,
CLASSIFICATION AND TEST FOR
IDENTIFICATION OF

- Alkaloids
- Glycosides
- Tannins
- Volatile oil
- Resin



ALKALOIDS



❑ INTRODUCTION

- Coined by **W. Meissner**, German Pharmacist in 1819.
- The term derived from the word "**alkali like**" so they have some character similar to naturally occurring complex amines.

❑ DEFINATION

Alkaloids are the **organic products** of plant origin, **basic in nature** and contain **one or more nitrogenous atoms** normally of **heterocyclic in nature**, and have marked physiological action when administered internally

TYPES	EXPLANATION AND EXAMPLE
1. True alkaloids	Nitrogen in heterocyclic ring and originate from amino acid. eg- Atropine, Morphine, Nicotine
2. Proto alkaloids (Amino alkaloids)	Contains nitrogen but not in ring system and originate from amino acid, eg- Mescaline, Ephedrine, Cocaine
3. Pseudo alkaloids	Do not originate from amino acid eg- Purine alkaloids, Terpenes & Steroid like alkaloids.
4. Polyamine alkaloids	Derivatives of putrescine, spermidine and spermine
5. Peptide and Cyclopeptide alkaloids	eg- Sativanine-N, Sativanine-O, Scutianene C

❑ PROPERTIES OF ALKALOID

- Most of alkaloids are **basic** in reaction due to the availability of one pair of electron on nitrogen
- The alkaloids contain one or more number of nitrogen and it may exist in the form as :
 - ✓ **Primary amine** - **Mescaline**
 - ✓ **Secondary amine** - **Ephedrine**
 - ✓ **Tertiary amine** - **Atropine**
 - ✓ **Quaternary amine** - **Tubocurarine Chloride**

- Alkaloids are **colourless, crystalline, nonvolatile, solid and bitter in taste**
- Alkaloids are generally optically active, among the levo isomers are more active
- Optically inactive are - **Papavarine, Atropine**

	Red	Betanidine
Colour alkaloids	Copper Red	Sanguinarine
	Yellow	Berberine, Tylophorine
Liquid alkaloids	Sparteine, Conine and Nicotine	
Optically inactive are	Papaverine, Atropine	

❑ CLASSIFICATION

- **Biosynthetic Classification**
- **Pharmacological Classification**
- **Taxonomic Classification**
- **Chemical Classification**

Biosynthetic classification

Given to the Precursor from which the alkaloids are produced in **plant biosynthetically**.

So all the alkaloids derived from the same precursor can be brought under same group even they have different taxonomic distribution and pharmacological activity.

e. g.

- **Piperidine alkaloids derived from lysin,**
- **Pyrrolidin alkaloids derived from ornithin**
- **Indole derived from tryptophan.**

Pharmacological Classification

Classification depends upon Pharmacological action

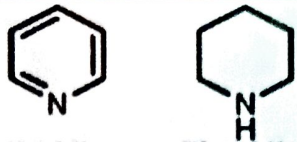
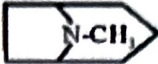
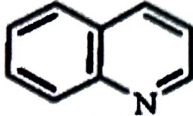
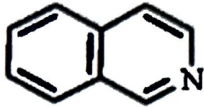
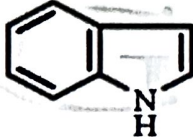
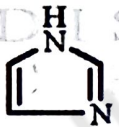
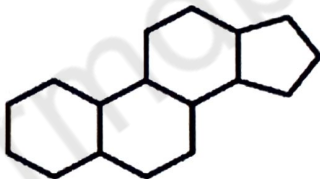
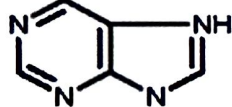
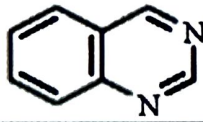

e.g. CNS stimulant or depression and anti malarias etc.

- In **cinchona**, **quinine** is an **anti malarial** where as **quinidine** is a **cardiac depressant**.
- In **opium** **morphine** is narcotic **analgesic** where as **codine** is **antitussive**.

Taxonomic classification:

Classification deals with the 'Taxon' Like genus, subgenus, species and subspecies etc. Large number of alkaloids are classified on their like various family like **rubiaceous alkaloids** and **solanceous alkaloids**.

Chemical Classification

S.NO.	Type of Alkaloids	Structure	Source
1.	Pyridine and Piperidine	 Pyridine Piperidine	Tobacco, Areca, Lobelia
2.	Tropane [G-10, 17]		Belladonna, Datura, Stramonium, Hyoscyamus, Dubosia, Coca
3.	Quinoline		Cinchona, Camptotheca
4.	Isoquinoline		Opium, Ipecac, Curare
5.	Indole		Ergot, Nux-vomica, Rauwolfia, Vinca, Physostigma
6.	Imidazole		Pilocarpus
7.	Steroidal		Veratrum, Kurchi, Ashwagandha
8.	Alkaloidal amine	$\text{CHCH}_2\text{CH}_2\text{NH}_2$	Ephedra, Colchicum
9.	Purine Alkaloid		Tea, Coffee, Kola, Cocoa.
10.	Glycoalkaloid	-	Solanum
11.	Quinazoline		Vasaka
12.	Terpenoid	-	Aconite
13.	Pyrazoline		Pepper



❑ TEST FOR IDENTIFICATION OF ALKALOIDS

Common test for alkaloids

S.NO.	REAGENT	OBSERVATION
1	Mayer's Reagent (Potassium mercuric iodide solution)	Creamy precipitate
2	Wagner's reagent (Potassium triiodide solution)	Reddish brown precipitate
3	Dragendroff's reagent (Potassium bismuth iodide solution)	Reddish brown precipitate
4	Hager's reagent (Picric acid)	Yellow precipitate
5	Sonnenschein's reagent (Phosphomolybdic acid)	Precipitate
6	Scheibler's reagent (Phosphotungstic acid)	Precipitate
7	Tannic acid test	Precipitated the alkaloid
8	Ammonia reineckate test (Saturated solution of ammonia reinecket)	Pink precipitate
9	Murexide test (Caffeine + HCl + KCl ₃)	Purple colour and when added alkali colour loss
10	Colchicine + Mineral acid	Yellow colour
11	Van Urk's test (Ehrlich Reagent) (Ergot powder + p-dimethyl aminobenzaldehyde)	Blue colour



IDENTIFICATION TEST		OBSERVATION	INFERENCE	
1.	LOBELIA: Lobelia + H ₂ SO ₄ + HCHO	Red color	Presence of lobelia	
2.	TROPANE ALKALOIDS		Presence of tropane alkaloids (Datura, Belladonna, Hyoscyamus)	
a.	Vitali-Morin Test Test solution + Fuming HNO ₃ + Evaporate to dry at 100°C + 3 % Methanolic KOH solution	Violet colour		
b.	Gerard Test Test solution + 2% Solution of mercuric Chloride in 50 % alcohol	White Precipitate		Hyoscine
		Red colour with heat		Hyoscyamine
c.	Test for coca Drug powder + H ₂ SO ₄	Red colour without heat	Atropine	
		Odour of methyl benzoate	Presence of Coca	
3.	QUINOLINE ALKALOIDS		Presence of cinchona Alkaloids	
a.	Thalleoquin test Powdered drug + Bromine water + Dilute ammonia solution	Emerald green colour		
b.	Blood red Test Dry Powder + glacial Acetic acid	Red Fumes appears		Presence of cinchona alkaloids
c.	Quinine, Quinidine, Cinchonine, Cinchonidine moisten with H ₂ SO ₄ under UV light	Blue fluorescence	Presence of Cinchona	
ISO-QUINOLINE ALKALOIDS				
OPIUM:				
4.	a. Marquis Test Aqueous solution of drug + Conc. H ₂ SO ₄ + HCHO	Dark Violet colour	Test for morphine	
	b. Meconic Acid Test Aqueous solution of drug + FeCl ₃ solution	Deep reddish purple colour	Presence of Meconic acid in opium	
	c. Morphine + SiO₂	Blue color	opium	
	d. Papaverine solution in HCl and potassium ferricyanide produce	Lemon yellow color	Presence of papaverine	
	e. Morphine + Conc. HNO ₃	Orange red color	Presence of morphine	
	f. Morphine + FeCl ₃ + Potassium ferricyanide	Bluish green color	Presence of morphine	

TEST FOR EMETINE:**Froehde's Reagent Test**

5. Powdered drug + Conc. H₂SO₄
+ Sodium Molybdate (Froehde's
Reagent)

Emerald green
colour

Presence of
emetine in
ipecac

GLYCOSIDES



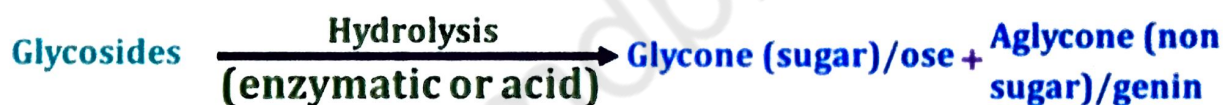
□ DEFINITION

The **organic compounds** mainly of plant origin and rarely of animal which on enzymatic or acid hydrolysis yields one or more sugar moieties (**Glycon**) and a non sugar moieties (**Aglycon or Genin**)

Aglycone - Responsible for **chemical and therapeutic property**

Glycone -

- Determine water and lipid solubility (**potency**)
- Facilitate the **absorption of glycoside** and help in **transportation of aglycon portion at the site of action**



□ PROPERTIES

- Colourless but some them are coloured like flavonoids are yellow and anthracene glycosides are red.
- They are **crystalline or amorphous solid compounds**.
- Glycosides are **optically active** and normally **levo** form is more active
- **Soluble in water and alcohol** but insoluble in chloroform and ether.
- Glycosides can be **hydrolysed by mineral acid, water and enzymes**.

□ CLASSIFICATION

1. On the basis of pharmacological action

LAXATIVE AND PURGATIVE	Aloe, Senna, Cascara
CARDIAC GLYCOSIDE	Digitalis, Stropanthus, Thevetia, Squill
IMMUNOMODULATOR	Ginseng, Picrorrhiza
EXPECTORANT	Liquorice, Wild cherry bark
BITTER GLYCOSIDE AND HEPATOPROTECTIVES	Gentian, Picrorrhiza, Chirata, Quassia

EMETIC**Black mustard****ANTIDIABETIC****Gymnema****LEUCODERMA****Psoralea, Ammi****ON THE BASIS OF LINKAGE OF GLYCOSE TO AGLYCONE**

TYPE	DESCRIPTION	EXAMPLE
C-glycosides	Sugar is connected to carbon atom $\text{aglycone} - \text{CH} + \text{OH} - \text{C}_6\text{H}_{11}\text{O}_5 \rightarrow \text{aglycone} - \text{C} - \text{C}_6\text{H}_{11}\text{O}_5 + \text{H}_2\text{O}$	Aloe, Cascara, Cochineal (carminic acid)
O-glycosides	Sugar is connected to O or phenol group $\text{aglycone} - \text{OH} + \text{OH} - \text{C}_6\text{H}_{11}\text{O}_5 \rightarrow \text{aglycone} - \text{O} - \text{C}_6\text{H}_{11}\text{O}_5 + \text{H}_2\text{O}$	Senna, Rhubarb
S-glycosides	Sulphur of SH group is attached to the sugar $\text{aglycone} - \text{SH} + \text{OH} - \text{C}_6\text{H}_{11}\text{O}_5 \rightarrow \text{aglycone} - \text{S} - \text{C}_6\text{H}_{11}\text{O}_5 + \text{H}_2\text{O}$	Sinigrin from black mustard
N-glycosides	N of NH (amino group) is attached to the sugar, $\text{aglycone} - \text{NH} + \text{OH} - \text{C}_6\text{H}_{11}\text{O}_5 \rightarrow \text{aglycone} - \text{N} - \text{C}_6\text{H}_{11}\text{O}_5 + \text{H}_2\text{O}$	Nucleoside

ON THE BASIS OF CHEMICAL NATURE

TYPE OF GLYCOSIDE		EXAMPLES
ANTHRAQUINONE GLYCOSIDES		Senna, Aloe, Cascara, Rhubarb, Hypericum
CARDIAC GLYCOSIDES		Digitalis, Strophanthus, Ouabain, Thevetia, Squill
SAPONIN GLYCOSIDES	TETRACYCLIC TRITERPENOIDS	Dioscorea, Shatavari
	PENTACYCLIC TRITERPENOIDS	Ginseng, Liquorice, Senega, Sarsaparilla, Quillaia bark, Jalbrahmi, Safed musali, Momordica, Gokhru
CYANOGENETIC GLYCOSIDES		Bitter almond, Wild cherry bark
ISOTHIOCYANATE GLYCOSIDES		Black mustard, Sinigrin
FLAVANOL GLYCOSIDES		Buckwheat, Gingko, Silymarin
COUMARIN GLYCOSIDES		Ammi, Visnaga, Psoralea, Tonka bean, Mylabris
ALDEHYDE GLYCOSIDES		Vanilla
PHENOL GLYCOSIDES		Bear berry
STEROIDAL GLYCOALKALOIDS		Solanum
BITTER GLYCOSIDES		Gentian, Picrorrhiza, Chirata,

❑ TEST FOR IDENTIFICATION OF GLYCOSIDES

❖ Antraquinone glycosides

ALOES



(a) General test

For these tests, **1 g of aloe powder is boiled with 10 ml water** and filtered with help of **kieselguhr**. The filtrate is used for bromine test and Schoenteten's reaction.

(1) Bromine test:

Freshly prepared bromine solution is added to a

↓
small quantity of drugs Containing Glycosides filtrate.

↓
The test gives a pale yellow precipitate of tetrabromalin

(1) Schoenteten's reaction (Borax test):

Little quantity of above filtrate is **treated with borax**

↓
Shaken well till the borax dissolves

↓
When few drops of this solution are added to a test tube nearly filled with
↓
water, a green fluorescence appears.

(b) Special test

(1) **Nitrous acid test:** Crystals of **sodium nitrite** along with small quantity of **acetic acid** are added to aqueous solution of aloe. The observations are as follows:

- **Curacao aloe** - Sharp pink to carmine colour
- **Cape aloe** - Faint pink colour
- **Socotrine and Zanzibar aloe** - Very less change in colour

This test is due to **isobarbaloin**

(2) **Nitric acid test:** This test is carried out either by directly applying nitric acid to drug or to its aqueous solution. The observations are as follows

- **Curacao aloe** - Deep brownish-red colour
- **Cape aloe** - Brownish colour changes to green
- **Socotrine aloe** - Pale brownish to yellow colour
- **Zanzibar aloe** - yellowish brown colour

(3) Cupraloin test (Klunge's isobarbaloin test):

To very dilute aqueous solution of aloes, a drop of saturated copper sulphate solution is added, followed by little quantity of sodium chloride and excess of 90 per cent alcohol

Following results are observed:-

- **Curacao aloes** - wine red colour persisting four hours
- **Cape aloes** - faint colouration rapidly changing to yellow(ii) Cape aloes
- **Socotrine aloes**- No. Colour
- **Zanzibar aloes**- No colour

(4) Modified anthraquinone test:

This test indicates the presence of **C-glycosides**



The aqueous solution of aloes is treated with **ferric chloride solution** and dilute **hydrochloric acid** to bring out the **oxidative hydrolysis of aloe-emodin**



The hydrolysis sets free **anthraquinones** which are **collected in organic solvent** like **carbon tetrachloride or ether**



The organic layer is separated and shaken with **dilute ammonia**.

The **ammoniacal layer** shows **rose-pink to cherry red colour**, indicating the presence of **C-glycosides**, viz. **aloe emodin**.

CASCARA

It contains **C glycoside** , gives **modified bornttager's test**



RHUBARB



(1) Rhubarb gives **positive result for modified Bornttager's test**.

(2) Rhubarb shows **red colour with addition of alkalies** due to presence of **anthraquinone glycosides**

SENNA



Bornttager's test employed for presence of **anthraquinone in senna leaves**

❖ Cardiac glycosides

DIGITALIS



Keller kiliani test (to detect the presence of digitoxose sugar)

1 gm Drug + 10 ml 70% Alcohol $\xrightarrow{2-3 \text{ min.}}$ Extract + Lead acetate + FeCl_3

Reddish green colour

Transferred to a tube containing 2 ml conc. H_2SO_4

↓
Glacial acetic acid

Legal test

Solution of glycoside + pyridine + **sod. Nitroprusside solution** + NaOH solution \longrightarrow **red pink colour** formed

Baljet test

Section of digitalis + **Solution of Sodium Picrate** gives **Yellow or Orange coloured**

Raymond's test

Section of digitalis and 50% $\text{C}_2\text{H}_5\text{OH}$ + 0.1 ml of **m-nitrobenzene** add 20 % NaOH gives **Violet colour**

Kedde test

Section of digitalis + **Kedde's reagent** gives **Blue or violet**

Antimony trichloride test

Section of digitalis + **Antimony trichloride and trichloroacetic acid** \longrightarrow **Blue colour** formed

INDIAN SQUILL

1. Mesophyll **stain red** colour with **alkaline colarin sol.**
2. **Reddish purple** colour with **0.1 M iodine sol.**



STROPHANTHUS

The glycosides show emerald green colour on addition of **80 per cent sulphuric acid.**

❖ Saponin glycosides

Common test for saponin glycosides

Foam test

Shake the extract vigorously with water produced **foam**

Haemolytic test

Extract + **drop of blood** placed on glass slide **Haemolytic zone** appears

Liebermann test

(Test for triterpenoid saponins)

Extract + **acetic anhydride** + heat \longrightarrow **Pink colour** appear

LIQUORICE

Section of drug + 80% H_2SO_4 \longrightarrow deep Yellow Colour



❖ Cyanogenetic glycoside

WILD CHERRY BARK

(1) **Sodium picrate test**: The small pieces of bark are put in a flask containing water. A filter paper soaked in sodium picrate is suspended at the neck of the flask. After some time, yellow colour of the paper is turned to brick red due to liberated hydrocyanic acid, which turns **sodium picrate into sodium isopurpurate**.

(2) The **hydrocyanic acid liberated** on hydrolysis reduces mercurous nitrate to metallic Shape mercury

(3) A piece of paper is dipped in guaiacum resin and moistened with dilute copper sulphated with a brittle to When it is exposed to freshly cut surface of drug, blue stain is produced.

❖ Isothocynate glycoside

MUSTARD SEED

When treated with alkali shows bright yellow colour

❖ Flavonoid glycoside

Shinoda test - Drug + 5ml 95% ethanol + conc.HCl + 0.5 gm of magnesium gives **Pink colour**



❖ Coumarine glycoside

PSORALEA

1. Hydro-alcoholic sol. of psoralen + propylene glycol + acetic acid gives **blue fluorescence**

❖ Bitter glycosides

GENTIAN

Under UV radiation gentian extract shows **light blue fluorescence**

GUDMAR

1. Dilute solution anaesthetises **sweet taste** buds
2. Gives **copious foam** after shaking with water and on addition of dil. hydrochloric acid voluminous precipitate



TANNINS



❑ INTRODUCTION

- Tannins are **polyphenolic substances** found in many plants product of **secondary metabolites**. As the name indicate they **posses the property of tan** i.e to convert hide and skin into the leather
- They act as **astringent** they have capacity to combine with protein and precipitate them

❑ DEFINATION

- The **complex, organic, non-nitrogenous, phenolic substance** of **higher molecular weight**
- They are used as antiseptics and in gastro-intestinal disease like diarrhoea. They are also used in leather industry

❑ PROPERTIES

- Tannins are **soluble** in **water, alcohol, dil. alkalies, glycerine and acetone** but **insoluble** in organic solvent such as **benzene ether** and **chloroform**
- They should posses **tanning properties**
- Tannins with ferric salt gives **blue, violet or green colour**.



- They have precipitate with alkaloids and have heavy metals therefore they are **used as antidotes** in alkaloidal and **heavy metal poisoning**. In aqueous solution tannin produce acidic reaction and have astringent test.

❑ CLASSIFICATION

Classification based on chemical nature

1. Hydrolysable tannins
2. Condensed tannins
3. Pseudotannins

1. Hydrolysable tannins:-

- These tannins are **hydrolysed by acids or enzymes** and **produce gallic acid or ellagic acid**
- Chemically they are **esters of sugar usually glucose** with one or more trihydroxybenzene carboxylic acid.
- With ferric chloride they produce they **produce blue colour** hence they are used in manufactured in ink.

Example:- Gallotannin from **rhubarb, chestnut, nutgall** and clove and ellagitannin from myrobalam of oak

2. Condensed tannins:

- They are also called as **phlobatannins or proanthocyanidins**. They are related to **flavonoids pigments** and have the **polymeric formula flavone-3-ol**.
- On the treatment with **acids or enzymes** these tannins are decomposed into red insoluble compounds called as **phlobaphens**.
- On heating these tannins produce catechol, therefore they are also called as catechol tannins.
- The drugs which contain condensed tannins are cinchona bark, cinnamon bark, pale and black catechu, cocoa, kola seeds etc.

3. Pseudotannins-

- Pseudotannins are **low molecular weight compounds**
- Do not respond to **Goldbeater's skin test**.
- Example of pseudotannins are catechins from cocoa and chlorogenic acid from nuxvomica and coffee.

❑ TEST FOR IDENTIFICATION OF TANNIN

1. Goldbeater's skin test-

The **Goldbeater's skin** (membrane prepared from the intestine of ox) is soaked with HCl

Then it is rinsed with distilled water and is added to the tannin solution (sample) for 5 minutes

It is washed with distilled water and transferred to 1% ferrous sulphate solution.

A **brown black colour** on the skin confirms the presence of tannins

2. Phenazone test-

10 ml of aqueous extract of tannins is prepared and **1gm of sodium acid phosphate** is added

Warm it, cool and filter it. To the filtrate **2% phenazone** solution is added.

All the tannins present are precipitated

3. Gelatin test-

To the solution of tannins add **1% gelatin** solution containing **10% sodium chloride**

The precipitate obtain confirms the presence of tannin.

4. Test with ferric chloride solution-

- To the solution of tannins add **ferric chloride solution**.
- A **blue, black, violet, or green** precipitate or colour confirm the presence of tannin.

5. Match-Stick test-

Dip a match stick in plant extract and dry it.

Moisten it with **conc. HCl**

Warm near the flame

The wood of match stick turns to **pink or red** in colour which confirms the presence of tannins

(On heating tannins with **conc. HCl** produce phloroglucinol. Further phloroglucinol react with the lignin of wood and produce pink colour)

VOLATILE OIL



□ INTRODUCTION

- Volatile oils are defined as “the odorous and volatile constituent of plant and animal species”
- Volatile oils are also termed as '**etheral oils**' because they evaporate when exposed to air at an ordinary temperature
- They are also called as '**essential oils**' as they are the essences or active constituents of the plant
- They are composed of terpenes, monoterpenes ($C_{10}H_{16}$), **sesquiterpenes** ($C_{15}H_{24}$), diterpenes ($C_{20}H_{32}$), polyterpenes ($(C_5H_8)_n$) and their derivatives

□ PROPERTIES

Properties of volatile oils -

- Characteristic odors
- High refractive index
- Optically active
- Immiscible with water
- Soluble in ethers, alcohol and most organic solvents

□ CLASSIFICATION

DRUGS CONTAINING	NAME OF CRUDE DRUG
MONOTERPENOIDS	Fennel, Palmarosa, Citronella, Chenopodium, Eucalyptus oil, Lemon grass oil, Peppermint oil, Caraway, Anise, Cummin, Cardamom, Dill, Lemon peel, Orange peel, Nutmeg, Cinnamon, Tulsi, Musk
SESQUITERPENOIDS	Artemisia, Sandal wood oil, Clove
DITERPENOIDS	Taxus, coleus
TRITERPENOIDS	Ambergris
TETRATERPENOIDS	Annatto, Saffron

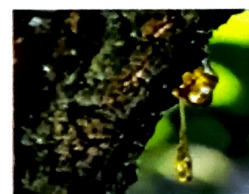
Types of volatile oil

CLASS	EXAMPLE OF DRUG
ALDEHYDE VOLATILE OILS	Bitter almond, Bitter orange peel, Cinnamon, Cassia, Lemon grass, Citronella oil, Lemon peel
ALCOHOL VOLATILE OILS	Coriander, Peppermint, Sandalwood, Cardamom
HYDROCARBON VOLATILE OILS	Black pepper, Turpentine
KETONE VOLATILE OILS	Buchu, Caraway, Cumin, Camphor, Dill, Jatamansi, Musk, Spearmint, Civet oil
PHENOLIC ETHER VOLATILE OILS	Anise, Calamus, Fennel, Nutmeg
OXIDE VOLATILE OILS	Chenopodium, Eucalyptus
ESTER VOLATILE OILS	Garlic, Lavender, Valerian, Gaultheria, Mustard
PHENOL VOLATILE OIL	Clove, Thyme

❑ TEST FOR IDENTIFICATION OF VOLATILE OIL

- Salkowski test:** Drug (mg) + CHCl_3 + H_2SO_4 gives **Yellow colour** which changes to red
- Noller test:** 20 mg drug + $\frac{1}{2}$ ml of (SnCl_2 in SOCl_2) → **Red colour**
- Antimony Trichloride test:** Antimony trichloride in CHCl_3 dip filter paper soaked in above solution, in drug solution → spray with H_2SO_4 and acetic anhydride. Orange red colour is produced

RESIN



- Resins are defined as "the **amorphous non nitrogenous products** of complex chemical nature"
- Resins are the **mixture of essential oil, oxygenated products of terpenes and carboxylic acids**
- Resins are formed in **schizogenous or schizolysigenous ducts or cavities of the plant**
- When the resins are produced as a normal product of metabolism without injury to the plant they are termed as normal or **physiological resin**

- If the resins are produced by **injury or wound** to the plant they are called as **abnormal or pathological resin** like **benzoin and tolu balsam**.
- Resins are present in different parts of the plant such as **roots, rhizomes, fruits, seeds, trunk, flowers and fruiting tops etc.**
- They are normally used as antiseptics, carminative, purgative, expectorant and analgesic etc.
- Resins are also obtained from animals **e.g. shellac**



❑ PROPERTIES

1. All resins are heavier than water, they are usually **amorphous, hard, and brittle solids**.
2. They are **insoluble in water** and usually **insoluble in petroleum ether**
3. Chemically, resins are complex mixtures of resin acids, resin alcohols (resinols), resin phenols (resinotannols), esters
4. **Chemically inert** compounds known as **resenes**.
5. **Many resins**, when boiled with alkalis yield soaps
6. By the action of heat they soften yielding clear, adhesive fluids, Resins burn with a characteristic, smoky flame.

❑ CLASSIFICATION OF RESINS

TYPE OF RESIN	DESCRIPTION
Acid resins	Resins occur along with their acids. e.g. - Colophony - Abietic acid, Sandracolic acid, Myrrh - Commiphoric acid Copaiba - Copaivic acid
Ester resins	This group contains esters as the chief constituents of the resins e.g. - Benzoin and Storax, Benzoin contains benzyl benzoate , Storax contains cinnamyl cinnamate
Resin alcohols	They occurs as in free state or as esters, e.g.- Balsam of peru with perru resino tannol, Guaiacum resin with guaic resinol

They are also further classified into -

- **Resins:** colophony, cannabis.
- **Oleoresins:** copaiba, ginger.
- **Oleo-gum-resins:** asafoetida, myrrh. **Balsams:** balsam of Tolu, balsam of Peru.
- **Glycoresins :** jalap **Resenes :** Asafoetida, colophony

❑ TEST FOR IDENTIFICATION OF VOLATILE OIL

IDENTIFICATION TEST	REAGENTS USED	POSITIVE RESULT	COMPOUND POSITIVE FOR THE TEST
HCl test	HCl	Pink colour	Presence of resins
FeCl₃ test	FeCl ₃	Greenish blue colour	Presence of resins
Umbelliferone test (specific test for asafoetida)	HCl + conc. NH ₄ OH, HNO ₃ , H ₂ SO ₄ washed with water	Blue fluorescence Green, red and violet colour	Umbelliferone
Copper acetate Test	petroleum test	Emerald green	Abietic acid
Test for Aspidium (oleoresin)	Diluted alcohol solution+ FeCl ₃	Green colour	filmarone , flavaspidinol, flavaspidic acid
Test for myrrh (oleo - gum - resin)	Ether + HNO ₃ + Br ₂ vapour	Purplish violet	Commiphoric acid

