

HERBAL DRUG TECHNOLOGY

UNIT 1 NOTES

HERBS AS RAW MATERIAL

- HERBAL PRODUCTS
- IDENTIFICATION & AUTHENTICATION

BIODYNAMIC AGRICULTURE

- GAP IN CULTIVATION
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- AYURVEDA
- SIDDHA
- UNANI & HOMEOPATHY



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HERBS AS RAW MATERIALS

HERBS

- Herbs are plants or plant parts - such as leaves, flowers, seeds, stems, or roots - that are valued for their medicinal, culinary, aromatic or therapeutic properties.
- They are commonly used in :
 - Medicine - For their healing properties (eg. echinacea, turmeric, ginseng).
 - Cooking - To enhance the flavour of food (eg. basil, oregano, thyme).
 - Cosmetics & Aromatherapy - For their fragrance and soothing effects (eg. lavender, chamomile).
 - Traditional Practices - Such as Ayurveda, Traditional Chinese Medicine, and folk medicine systems.

CHARACTERISTICS OF HERBS

- Generally soft, non-woody stems
- Typically small to medium in size
- Often have strong scents or flavours
- May grow in a variety of climates and soils
- Contain bioactive compounds like alkaloids, flavonoids or essential oils
- Used in traditional and modern medicine
- Easily propagated through seeds or cuttings
- Can be used fresh or dried for various applications.

SOME IMPORTANT DEFINITIONS

① HERBS

A plant or part of plant (like leaves, roots or flowers) used for its medicinal, aromatic or culinary properties.

Usually, herbs have soft, non-woody stems.

② HERBAL MEDICINE SYSTEM

A system of medicine that uses natural plant materials to treat or prevent diseases, often based on traditional knowledge like Ayurveda or Unani.

③ HERBAL MEDICINE PRODUCT

A finished product made from one or more herbal ingredients, such as tablets, syrups, creams or oils, used for health benefits.

④ HERBAL DRUG PREPARATION

The process of cleaning, drying, grinding, and extracting active compounds from herbs to make medicinal formulations.

SOURCES OF HERBS

Herbs are mainly obtained from two sources :

- ① Wild sources
- ② Cultivated Sources

① WILD SOURCES OF HERBS

- These are herbs that grow naturally in forests, mountains or uncultivated lands without human intervention.
- They are collected directly from their natural habitat.
- Examples : Neem leaves from forest trees , Amla from wild trees etc.

KEY POINTS

- Naturally grown
- Not farmed or managed by humans
- May vary in quality and quantity
- Risk of overharvesting and ecological damage

② CULTIVATED SOURCE OF HERBS

- These are herbs that are grown intentionally by humans on farms or in garden under controlled conditions for commercial or medicinal use.
- Example : Tulsi, Ashwagandha and Aloe vera grown on herbal farms.

KEY POINTS

- Grown under human supervision
- Better control over quality and yield
- Sustainable and reliable supply
- Used for large-scale production

SELECTION, IDENTIFICATION & AUTHENTICATION OF HERBAL MATERIAL

① SELECTION OF HERBAL MATERIAL

Purpose: Selecting the correct and useful plant for medicine.

Based on:

- Traditional used in Ayurveda, Unani etc.
- Local or tribal knowledge.
- Scientific research and lab studies.

Things to consider:

- Easily available and not rare
- Effective and safe
- Which part of plant is used (root, leaf, bark etc)

Example: Ashwagandha (*Withania Somnifera*) is selected for reducing stress & boosting immunity.

② IDENTIFICATION OF HERBAL MATERIAL

Purpose: Recognizing the correct plant species.

Method:

- By looking (macroscopy) - color, shape, size, smell & taste.
- Under microscope - looking at plant cell, hairs (trichomes), and pores (stomata).
- Botanical classification - Identifying family, genus and species.

Example: Neem (*Azadirachta indica*) is identified by its toothed leaves and bitter taste.

③ AUTHENTICATION OF HERBAL MATERIAL

Purpose: Confirming that the herb is genuine and not mixed with other substances.

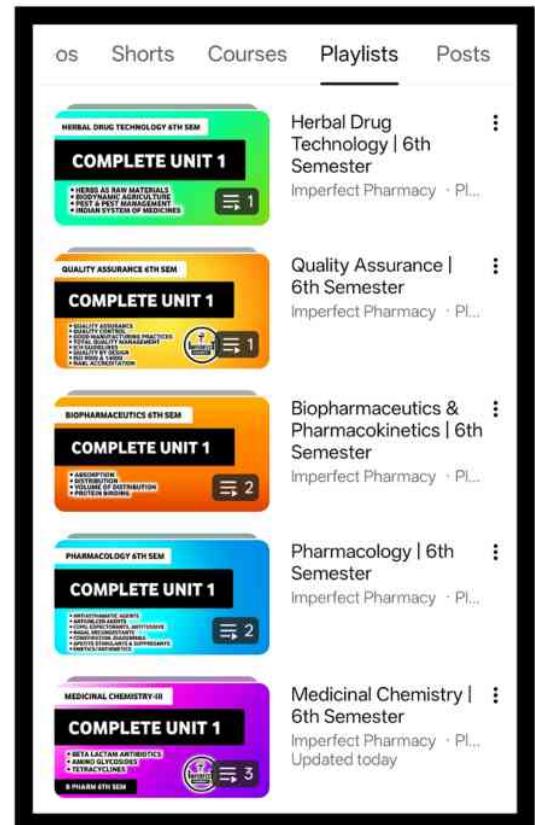
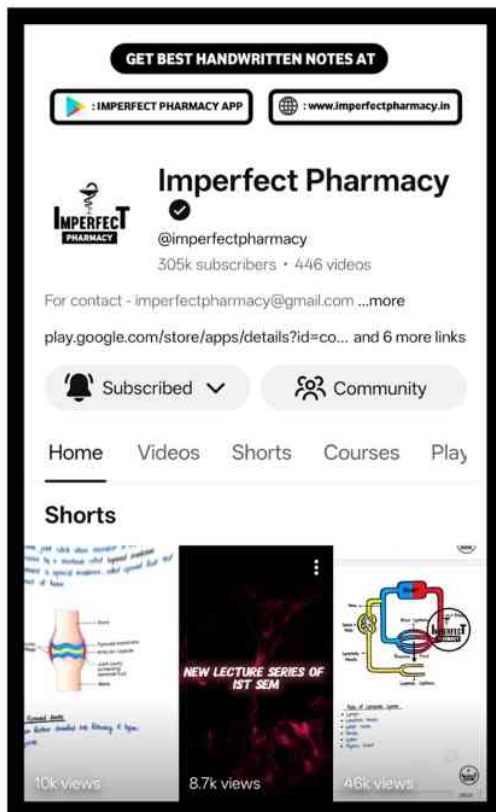
Method: • Physical & Microscopic check: Comparing with standard features.

- Chemical tests: TLC, HPTLC, HPLC to check active compounds.
- DNA barcoding: Checking plants DNA to confirm species.

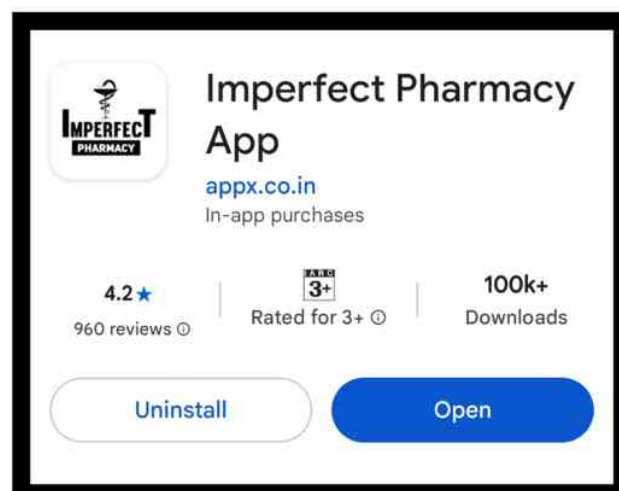
Example: Turmeric (*Curcuma longa*) is authenticated by checking curcumin content using HPTLC and rhizome structure under a microscope.

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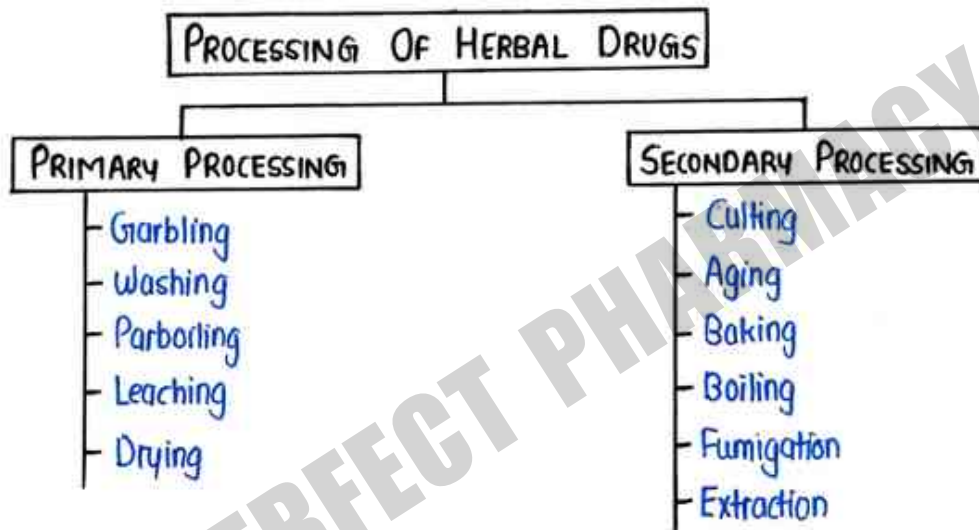


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PROCESSING OF HERBAL DRUGS

- The processing of herbal drugs involves several stages to ensure their quality, safety and efficacy.
- These stages are broadly categorized into two parts :
 - ① Primary Processing
 - ② Secondary Processing



① PRIMARY PROCESSING

- Primary processing refers to the initial, basic steps taken after the raw herbal material is collected.
- The goal is to clean, preserve and prepare the herbs for further processing or storage.
- These steps are crucial for removing impurities and preventing degradation.
- Common primary processing steps include :

④ GARBLING / SORTING

- This is the process of removing foreign matter (e.g., soil, dust, insects, dead tissues, non - medicinal plant parts) from the harvested herbal material.
- It ensures the purity & cleanliness of the raw drug.
- The specific method depends on the plant part (e.g. peeling barks, sieving, trimming).

⑤ WASHING

- After garbling, the herbal material is thoroughly washed with clean water to remove any remaining dirt, soil or impurities from its surface.
- For roots, rhizomes, and tubers, scraping and brushing might be necessary.

⑥ PARBOLING / BLANCHING

- Some herbal materials are partially immersed in boiling water.
- This process can help improve storage, prevent insect and mold contamination, and facilitate the removal of stubborn impurities or outer coats.

⑦ LEACHING

- This involves subjecting the plant material to running water to remove certain impurities.
- However, the duration must be controlled to prevent the loss of valuable chemical constituents.

② DRYING

- This is a critical step to remove moisture from the herbal material, which prevents deterioration, degradation of active constituents and microbial or mold infestation.
- Drying can be done by naturally (open air under direct sunshine, protected from contaminants) or artificially (using controlled heat and equipment, depending on the nature of the herb).

② SECONDARY PROCESSING

- Secondary processing involves more advanced techniques applied to the primary - processed herbal materials.
- These steps aim to enhance the efficacy, reduce toxicity, extract active compounds, or prepare the herbs into specific dosage forms.
- The methods used in secondary processing are often specific to the herbs and its intended therapeutic uses.
- Common secondary processing steps include:

① CUTTING/GRINDING

- After drying, herbal materials are cut or sectioned into smaller, uniform sizes (eg. small particles, coarse powder, fine powder) for convenient storage and to facilitate extraction.
- This process is often followed by grinding to a desired fineness.

⑥ AGING / SWEATING

- Some raw are stored for a specific period at controlled temperatures and humidity.
- This process can reduce irritant effects or enhance certain properties of the herb.

⑦ BAKING / ROASTING

- Herbal materials are heated in an oven or frying pan, often with continuous stirring, until their external color changes.
- This can alter the chemical composition, enhance flavour, or modify therapeutic properties.

⑧ BOILING / STEAMING

- The herb is cooked in water or another liquid solvent (e.g. vinegar, wine, milk).
- This method is used to extract water-soluble compounds and can also be employed to enhance specific effects or reduce toxicity.

⑨ FUMIGATION

- Raw herbal materials are subjected to fumes (e.g. sulfur dioxide) for preservation, color improvement, bleaching, or to prevent insect and mold growth.

⑥ EXTRACTION

- This is crucial secondary processing step where active chemical constituents are separated from the plant material using selective solvents (menstruum).
- Common extraction methods include:
 - Decoction
 - Percolation
 - Infusion etc.

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BIODYNAMIC AGRICULTURE

- Biodynamic Agriculture was introduced by Australian philosopher name Rudolf Steiner & developed in popularity since 1922.
- He formulated the organic approach to agriculture in the western world by linking unhealthy agriculture & unhealthy social life.
- It views the farm as a self-sustaining living organism that integrates plants, animals & cosmos.
- In other words, it is known as Organic farming.

PRINCIPLE OF BIODYNAMIC FARMING

① Farm as an organism

- The farm is treated like a living organism — where everything (soil, plants, animals, people) works together like parts of one body.

② Biodynamic Preparations

- Farmers use natural mixtures made from things like cow dung, herbs, flowers and minerals.
- These help improve soil health and plant growth.

③ Cosmic & Lunar Rhythms

- Biodynamic farmers follow moon cycles and planetary positions to decide the best time to plant, harvest and water.
- They believe the cosmic energy affects plant life.

④ No Synthetic Chemicals

- Like organic farming, biodynamic farming uses no chemical fertilizers or pesticides.
- Only natural and eco-friendly methods are used.

⑤ Healthy soil = healthy plants

- A big focus is on keeping the soil alive and fertile, using compost, cow dung, green plants (green manure) and crop rotation.

⑥ Biodiversity

- Biodynamic farms grow different crops and also keep animals.
- This natural mix keeps the farm balanced and healthy.

GAP IN CULTIVATION OF MEDICINAL PLANTS

INTRODUCTION

- A good Agricultural Practices of medicinal plants is a cultivation program designed to ensure optimal yield in terms of both the quality and quantity of any crop intended for health purposes.
- The guidelines on Good Agricultural Practices (GAP) provide us the documented proof on how to handle medicinal plants right from its cultivation to post harvesting operations.
- Raw medicinal plant materials should meet all applicable national or regional quality standards.

OBJECTIVES

- To raise the income level in rural areas.
- To provide sufficient inputs to agro-processing industries.
- To improve the quality, safety and efficacy of finished herbal products.
- To guide the formulation of national or regional guidelines and monographs for medicinal plants and related standard operating procedures (SOPs).
- To encourage and support the sustainable cultivation and collection of medicinal plants.

GAP GUIDELINES FOR MEDICINAL PLANTS

① Selection of Medicinal Plants

- When choosing new medicinal plants, make sure the correct species and variety are selected.
- It should match the plants used in traditional medicine from the country it came from.

② Identification / Authentication

- Every plants must have its full scientific name (genus, species, variety) verified and written down clearly - no guesswork.

③ Specimens

- If you're not sure about a plant's identity, take a sample and get it verified by a proper herbarium or expert following WHO guidelines.

④ Seeds & Planting Material

- Use high quality seeds or cuttings that are clean and disease-free.
- The supplier must give full details about quality, performance, and where it came from.

⑤ Cultivation (Growing the Plants)

- Medicinal plants need careful handling and attention while growing.
- The way you grow them depends on what type of plant it is and its quality needs.

⑥ Site Selection (Choosing the land)

- Even the same plant species can grow differently in different places.
- Choose the site based on soil quality, climate, and environment.

⑦ Ecological and Social Impact

- Farming should not harm the environment or local people.
- Monitor its effects on nature and the community regularly.

⑧ Climate

- Things like rainfall, temperature, and day length affect how well medicinal plants grow and their healing quality.

⑨ Soil

- Good soil should have the right type, drainage, moisture and nutrients.
- Use safe fertilizers, but never use human waste because it can carry dangerous germs.

⑩ Irrigation & Drainage

- Give water according to the plant's growth stage.
- Make sure drainage is proper and the water used is clean and upto standard.

⑪ Plant care & Protection

- Take care of plant, especially the part that is used for medicine.
- Use chemicals only if there's no other option, and only in small amounts.

⑫ Harvesting & Drying

- Harvest carefully — don't let weeds or toxic plants get mixed in.
- Dry the plants in the best conditions, avoiding rain, dew or high moisture.

⑬ Storage

- Store medicinal plants properly to keep them fresh and safe for use later.

PEST AND PEST MANAGEMENT IN MEDICINAL PLANTS

PEST

- A pest is any insect, animal, or organism that cause damage to plants.
- In medicinal plants, pests are a serious problem because they:
 - Eat or destroy parts of the plant (like leaves, stems, roots).
 - Spread diseases.
 - Reduce the quality, purity, and medicinal value of the plant.

PEST MANAGEMENT METHODS

① CULTURAL METHODS

- Keeping the field clean.
- Rotating crops (changing crops seasonally).
- Removing weeds and infected plants early.

② MECHANICAL METHODS

- Handpicking insects.
- Using physical traps like light traps or sticky sheets.
- Putting nets or covers on plant.

③ BIOLOGICAL METHODS

Using natural enemies of pests like:

- Ladybugs
- Birds
- Micro-organisms like *Bacillus thuringiensis* (Bt).

BIOPESTICIDES/ BIOINSECTICIDES

- Biopesticides are pesticides made from natural sources like plants, bacteria, or minerals.
- They are safe, eco-friendly, and suitable for medicinal plants.

EXAMPLES

- Neem oil - Made from neem seeds, repels many insects.
- Bt (*Bacillus thuringiensis*) - A bacteria that kills caterpillars.
- Garlic / Chili extract - Act as a repellent.
- Trichoderma - Fights fungal diseases.

BENEFITS

- Safe for Humans and animals.
- Doesn't harm the medicinal value of the plant.
- Doesn't pollute soil or water.

INDIAN SYSTEM OF MEDICINES

- Indian systems of medicine refer to the traditional medical practices that originated and evolved in India over thousand of years.
- These systems are deeply rooted in Indian philosophy, culture, and history and are aimed at promoting holistic health — encompassing the body, mind and spirit.
- The major recognized Indian systems of Medicine include:

① Ayurveda

- Meaning "science of life", Ayurveda is based on balancing the body's three doshas (Vata, Pitta and Kapha) through diet, herbal remedies, lifestyle changes and detoxification.

② Siddha

- One of the oldest systems, practiced mainly in South India, especially Tamilnadu, it emphasizes the use of herbs, minerals, and yogic practices.

③ Unani

- Derived from Greek medicine and developed in India under Islamic influence, it focuses on the balance of bodily humors (blood, phlegm, yellow bile, and black bile) for health.

④ Yoga and Naturopathy

- Yoga involves physical postures, breathing exercises, and meditation for physical and mental well-being.
- Naturopathy relies on natural elements like water, air, diet and lifestyle to maintain health and treat diseases.

⑤ Homeopathy

- Though a European origin, it has been widely practiced in India and is officially recognized, it uses highly diluted substances to trigger the body's natural healing response.

ADMINISTRATION

- In India, these systems are regulated and promoted by the Ministry of AYUSH, which stands for:
 - A - Ayurveda
 - Y - Yoga & Naturopathy
 - U - Unani
 - S - Siddha
 - H - Homeopathy
- These systems are increasingly being integrated with modern healthcare approaches for preventive and promotive health care.

AYURVEDIC SYSTEM OF MEDICINE

- Ayurveda meaning "Science of Life" (from the Sanskrit words Ayur = Life and Veda = knowledge), is one of the world's oldest holistic healing systems, developed in India over 5,000 years ago.
- It is a traditional system of medicine that focuses on preventing and treating illness through lifestyle practices and natural therapies that aim to balance the body, mind and spirit.

PRINCIPLE OF AYURVEDA

Ayurveda is based on following principles:

① Panchamahabhuta (five elements)

- Ayurveda believes that all matter (including the human body) is composed of five basic elements:
 - Akasha (Ether / Space)
 - Vayu (Air)
 - Agni (Fire)
 - Jala (Water)
 - Prithvi (Earth)
- These elements combine in various ways to form the Tridoshas.

② Tridosha Theory (Three Biological Energies)

The body is governed by three fundamental energies or "doshas".

DOSHA	ELEMENTS	FUNCTIONS
Vata	Air + Ether	Movement, Breathing, circulation, nervous
Pitta	Fire + Ether	Digestion, Metabolism, Heat regulation
Kapha	Water + Earth	Structure, Lubrication, Stability, Immunity

③ Prakriti (Body Constitution)

- Every individual has a unique combination of the three doshas, which determines:
 - Physical characteristics
 - Mental tendencies
 - Disease susceptibility
 - Suitable diet & lifestyle
- Understanding one's prakriti is a key to personalized treatment in Ayurveda.

④ Dhatu (Body tissues)

- There are seven dhatu (basic tissues) that sustain the body:
 - Rasa (Plasma)
 - Rakta (Blood)
 - Mamsa (Muscle)
 - Meda (Fat)
 - Asthi (Bone)
 - Majja (marrow and nerve tissue)
 - Shukra (Reproductive tissue)
- Health is maintained when these dhatu are balanced.

⑤ Agni (Digestive Fire)

- Agni governs digestion, absorption and metabolism.
- There is different types of agni, but Jatharagni (digestive fire in the stomach) is the most important.
 - Balanced Agni = Good health
 - Weak / Imbalanced Agni = Toxin formation (Ama) and disease

⑥ Malas (Waste Product)

- The body excretes waste through three main malas:
 - Purisha (Feces)
 - Mutra (Urine)
 - Sveda (Sweat)
- Proper elimination is essential for health.

METHOD OF DIAGNOSIS

- Nadi Pariksha (Pulse Diagnosis)
- Aihva Pariksha (Tongue Examination)
- Mala Mutra Pariksha (Stool & Urine Analysis)
- Sparsha (Touch)
- Darshana (Observation)
- Prashna (Interrogation)

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PREPARATION & STANDARDIZATION OF AYURVEDIC FORMULATIONS

- Ayurvedic formulations are traditional herbal & mineral preparations used in treatment & prevention of various diseases.
- The preparation & standardization of these formulations are essential to ensure their safety & efficacy.

TYPES OF AYURVEDIC FORMULATIONS

- ① Asawas & Aristas : Fermented Herbal Preparations.
- ② Churna : Fine Herbal Powders
- ③ Gihutikas/ Ualis : Herbal tablets or pills
- ④ Lehyas : Semi-solid herbal jams
- ⑤ Bhasmas : Calined metal or mineral preparations.

① **GIHUTIKA**

Preparation : Ingredients : fine powders of Herbs, minerals & binders like honey or ghee.

Procedures :

- All ingredients are finely powdered & sieved.
- Powders are mixed uniformly.
- A suitable binding agent is added.
- The mass is rolled into pills/ tablets of specific size.
- Dried in shade & stored in airtight containers.

Standardization

- Uniform weight & diameter of tablets.
- Disintegration time.
- Hardness & Friability
- Microbial load testing
- Chemical profiling using HPTLC & TLC.

② **ARISTA & ASAUA**

- Preparation :
- Arista : Prepared by boiling herbs in water (decodion)
 - Asava : Made by soaking herb in sugar/jaggery solution without boiling.
 - Fermentation : Done naturally using Dhataki flowers or old batch starter.
 - Duration : 14-45 days in airtight container.

- Standardization :
- Alcohol content (should be within 5-10%)
 - Total solids & specific gravity.
 - pH (usually slightly acidic)
 - Organoleptic Characters (taste, odor, color)
 - TLC / HPTLC
 - Microbial & fungal contamination check.

③ **CHURNA**

- Preparation :
- Raw materials are dried properly under shade.
 - Dried materials are ground to a fine powder.
 - Powder is sieved (usually through mesh no. 80)
 - Stored in dry, airtight containers to prevent moisture absorption.

- Standardization :
- Fineness of powder (sieve test).
 - Loss on drying (moisture content).
 - Total ash and acid-insoluble ash.
 - Identification using TLC.
 - Microbial contamination limits.
 - Organoleptic evaluation (color, taste, smell).

④ **LEHYA**

- Preparation :
- Decoction of herbs is prepared.
 - Sugar, jaggery, or ghee is added and boiled to semisolid consistency.
 - Powders of herbs/species are added at end.
 - The final product is cooled and stored in wide-mouthed jars.

- Standardization :
- Moisture content (should be low to prevent microbial growth).
 - Total solids
 - Consistency and appearance
 - TLC / HPTLC analysis
 - Microbial testing
 - Heavy metal analysis if minerals used.

⑤

BHASMA

Preparation : ● Shodhana (Purification):- Toxic metals/minerals are purified using herbal decoctions.

- Marana (Calcination):- Purified material is ground with herbal juices and subjected to repeated heating in earthen pots.
- Number of Putas :- (Heating cycles) depends on the type of metal.

Standardization : ● Rekha Purnatva - Finely powdered bhasma enters skin lines.

- Varitaratva - Bhasma floats on water.
- Nirdhuma - Should be smokeless on fire.
- Laghutva - Light in weight.
- Niswadu - Tasteless.

Modern Tests : ● Particle size analysis (microscopy)

- XRD, AAS for metal content.
- Absence of toxic metals in unsafe quantities.

UNANI SYSTEM OF MEDICINES

- The unani system of medicine is a traditional system of healing & health maintenance based on the teachings of ancient Greek physicians like Hippocrates and Galen, and later developed by Arab & Persian scholars such as Avicenna (Ibn Sina).
- The term Unani derived from "Yunan", the Arabic name for Greece.
- Unani medicine emphasizes the balance of body humors and focuses on natural healing using diet, herbal remedies and regimental therapies.

PRINCIPLE

- The Unani system is based on the Humoral Theory (Nazriya Akhlat) which states that the human body consists of four humors (Akhlat-e-Arba).
- Health is properly maintained by the proper balance of these humors and disease is caused by their imbalance.

HUMOR	ELEMENT	TEMPERAMENT (MIZAJ)
Blood (Dam)	Air	Hot & Moist
Phlegm (Balgham)	Water	Cold & Moist
Yellow bile (Safra)	Fire	Hot & Dry
Black bile (Suada)	Earth	Cold & Dry

SIDDHA SYSTEM OF MEDICINES

- The siddha system is one of the oldest traditional systems of medicine, originating in South India, particularly Tamil Nadu.
- It is based on ancient Dravidian culture and philosophy and is believed to have been developed by Siddhars, who were enlightened sages.
- The word "Siddha" derived from the Tamil word "Siddhi", meaning perfection or attainment.
- It emphasizes a holistic approach to health and treats not only the diseases but also focuses on spiritual, physical, mental and environmental well-being.

PRINCIPLE

The fundamental principle of Siddha medicine is based on the concepts of five basic elements (Pancha Bootham) and three humors (Mukkuttram), similar to Ayurveda.

① Pancha Bootham (Five Elements) :

Everything in universe, including the human body, is composed of:

- Earth (Prithvi) – solidity & structure
- Water (Appu) – Fluidity
- Fire (Thee) – Metabolism & energy
- Air (Vayu) – Movement
- Ether / space (Akasham) – Accomodation

② Mukkuṭṭam (Three Humors or Doshas) :

These are functional principles that maintain physiological balance :

- Vatham (Air & Space) - Responsible for movement and nerve function.
- Pittam (Fire & Water) - Responsible for digestion, metabolism, and body heat.
- Kapham (Water & Earth) - Responsible for stability, lubrication and immunity.
- Health is considered a balanced state of these three humors, and disease occurs due to their imbalance.

HOMEOPATHIC SYSTEM OF MEDICINE

- Homeopathy is a holistic system of medicine founded by Dr. Samuel Hahnemann in the late 18th century in Germany.
- The term "homeopathy" is derived from the Greek words:
 - "Homeo" meaning similar.
 - "Pathos" meaning suffering.
- It is based on the concept of stimulating the body's natural healing process using highly diluted substances.

PRINCIPLE

- The fundamental principle of homeopathy is the "Law of Similars" (Similia Similibus Curentur), which means:
 - "Like cures like" – A substance that causes symptoms in a healthy person can be used in a very small dose to treat similar symptoms in a sick person.

CORE CONCEPTS

① Law of Similars :

As stated above, a remedy that produces symptoms in a healthy person can cure similar symptoms in the diseased state.

② Minimum Dose Principle:

- Homeopathic remedies are prepared through serial dilution and succussion (vigorous shaking), which reduces the toxicity but enhances the healing power (potency).
- The lower the dose, the higher the potency.

③ Individualization:

- Treatment is tailored to each individual's physical, mental and emotional symptoms, not just the disease.

④ Holistic Approach:

- Focuses on treating the whole person, not just the disease.
- It takes into account lifestyle, emotional health and constitution.

⑤ Vital Force Theory:

- Homeopathy believes in a vital force or life energy that maintains health.
- Disease is the result of imbalance in this force and remedies aim to restore this balance.

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