

UNIT-V

Basics of Phytochemistry



Presented By

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Modern methods of extraction

- **Extraction techniques of Medicinal plants**
- Extraction, as the term is used pharmaceutically, involves the **separation of medicinally active portions** of plant or animal tissues from the inactive or inert components by using selective solvents in standard extraction procedures.
- The products so obtained from plants are relatively impure liquids, semisolids or powders intended only for oral or external use.
- Simply Extraction can be defined as the removal of soluble materials from an insoluble residue, either liquid or solid, by treatment with a liquid solvent.

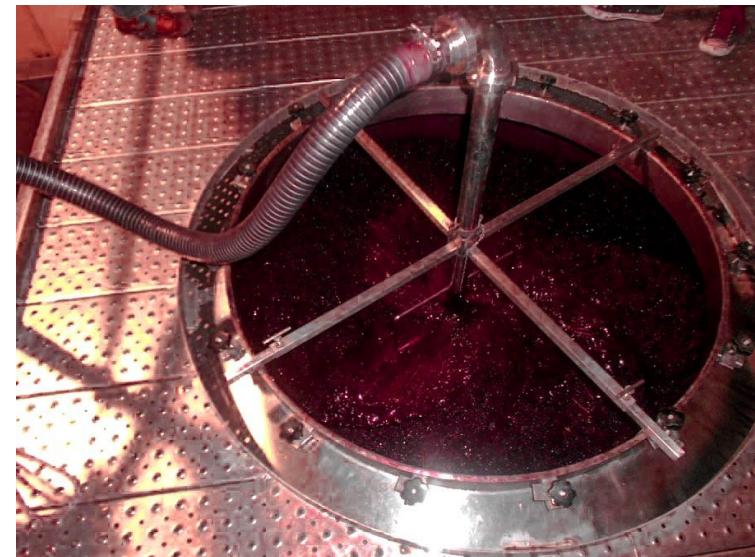
- The extract thus obtained may be ready for use as a medicinal agent in the form of tinctures and fluid extracts, it may be further processed to be incorporated in any dosage form such as tablets or capsules, or it may be fractionated to isolate individual chemical entities.
- The main aims of standardized extraction procedures for crude drugs are to attain the therapeutically desired portion and to eliminate the inert material by treating with a selective solvent known as menstrum.

Methods of Extraction of Medicinal Plants

- **Maceration**
- **Infusion**
- **Digestion**
- **Decoction**
- **Percolation**
- **Hot Continuous Extraction (Soxhlet)**
- **Aqueous Alcoholic Extraction by Fermentation**
- **Counter-current Extraction**
- **Ultrasound Extraction (Sonication)**
- **Supercritical Fluid Extraction**
- **Phytonics Process**

Maceration

- In this process the solid materials with whole of menstrum in a closed vessel and **allowed to stand for 7 days with frequent agitation.**
- The soluble matter has dissolved and **press the marc and mix the liquid** obtained with the **mother liquor** and the combined liquids are clarified by filtration or **decantation after standing.**



Infusion

- In this process the crude drug are macerated with **cold or boiling water** to obtain fresh infusion.
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- These are dilute solutions of the readily soluble constituents of crude drugs.



Digestion

- In this process the crud drug arte placed in the form of maceration in which **gentle heat** is used during the **process of extraction**.
- It is used when moderately elevated temperature is not objectionable.

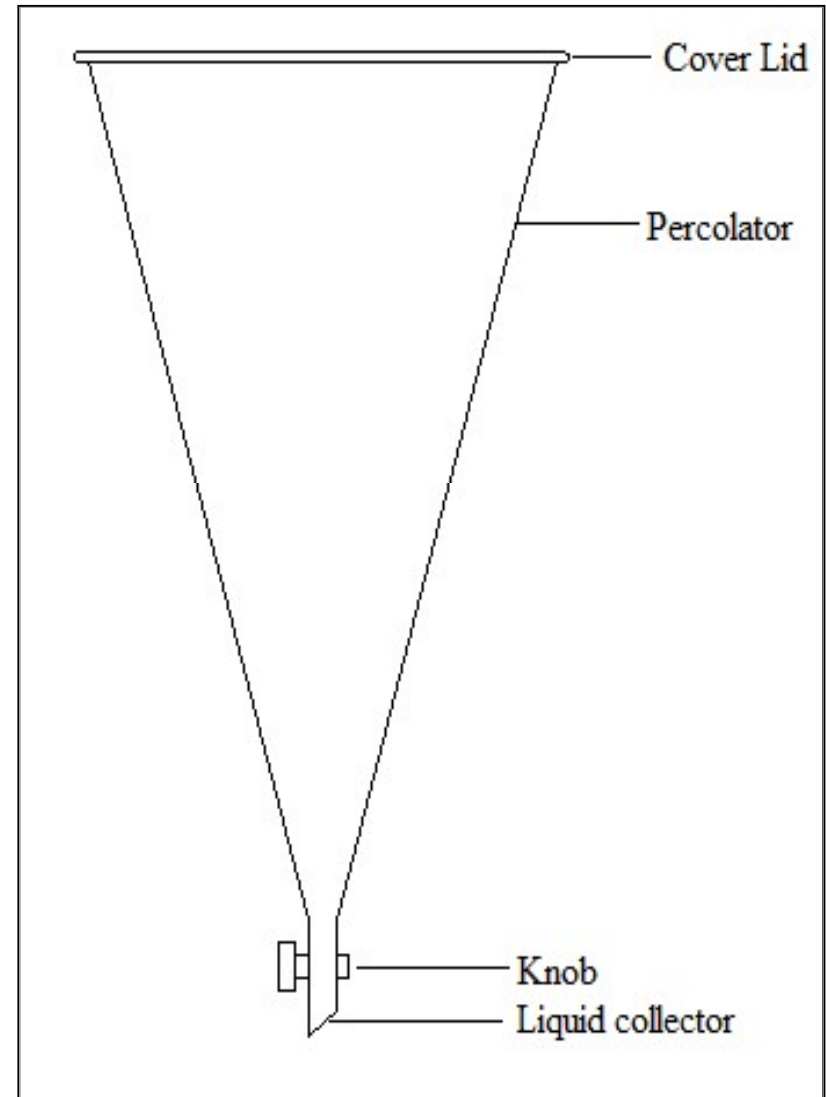
Decoction

- In this process, the crude drug is **boiled in a specified volume of water** for a defined time; it is **then cooled and strained or filtered**.
- This procedure is suitable for extracting **water-soluble, heat stable constituents**.

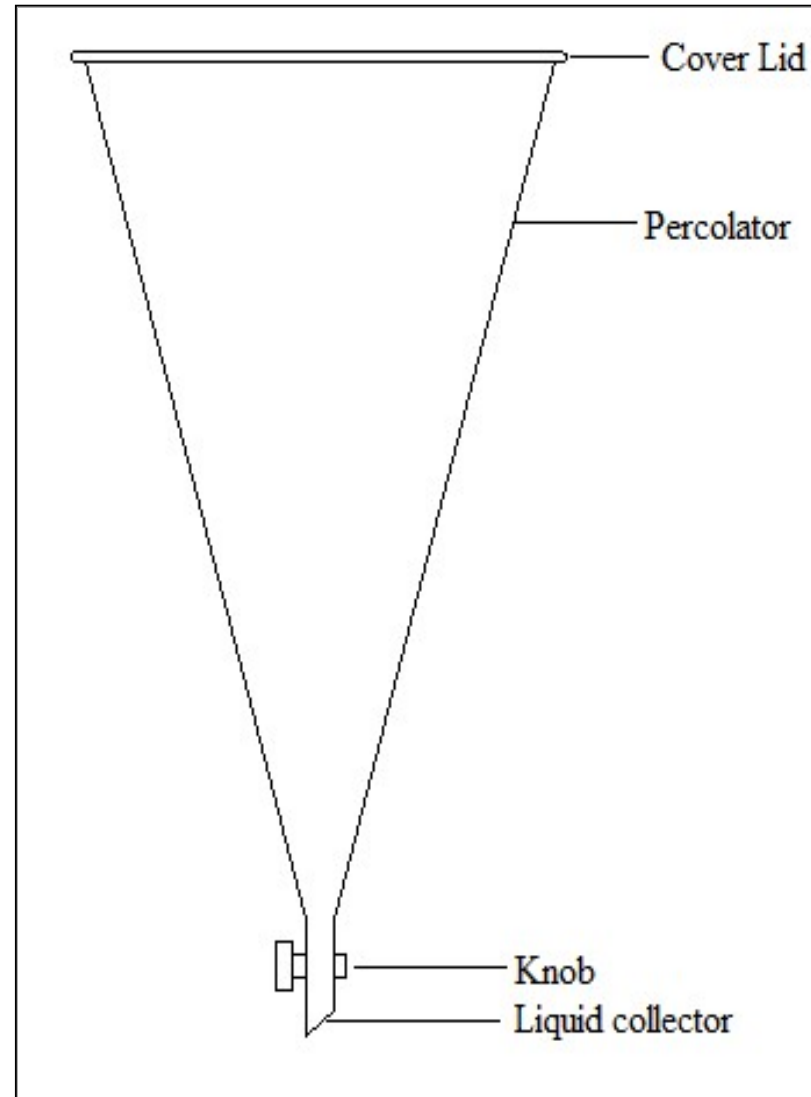


Percolation

- A percolator having a narrow, **V-shaped vessel** open at both ends are generally used.
- The solid ingredients are moistened with an appropriate amount of the specified menstrum and allowed to stand for **approximately 4 h** in a well closed container.
- After which the mass is **packed and the top** of the percolator is closed.

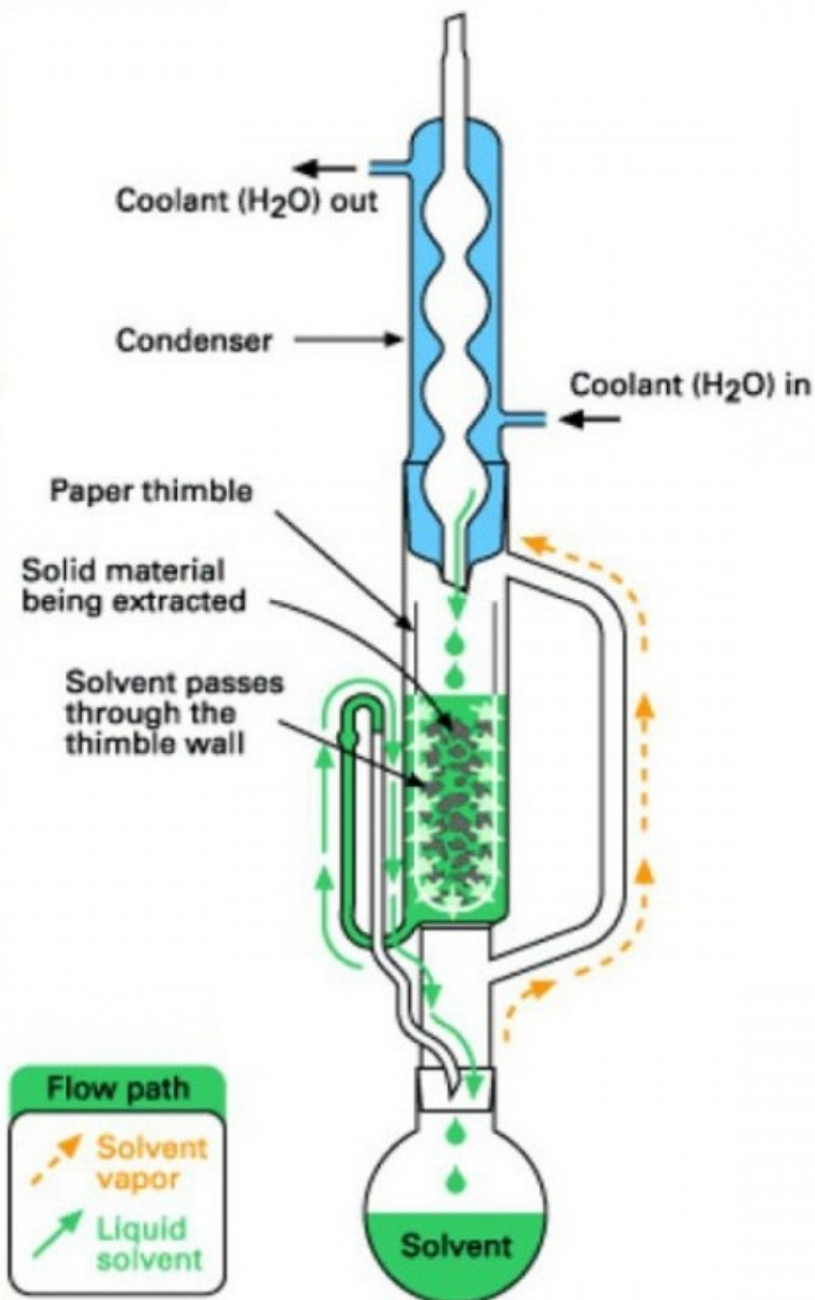


- Additional menstrum is added to form a shallow layer above the mass, and the mixture is allowed to macerate in the **closed percolator for 24 h.**
- The outlet of the percolator then is opened and the liquid contained therein is allowed to **drip slowly.**
- Additional menstrum is added as required, until the percolate measures about **three-quarters** of the required volume of the finished product.



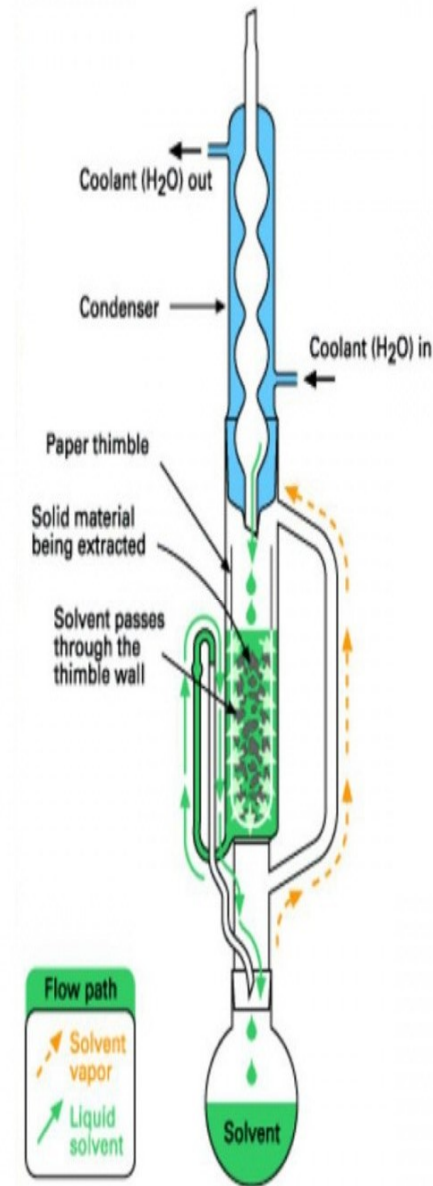
- The **marc is then pressed and** the expressed liquid is added to the percolate.
- Sufficient menstrum is added to produce the required volume, and the mixed liquid is clarified by filtration or by standing followed by decanting.

Hot Continuous Extraction (Soxhlet)



Hot Continuous Extraction (Soxhlet)

- Soxhlet apparatus which constituted by **condense, thimble, vapour tube and round bottom flask.**
- The solvent is heated to reflux. The solvent vapour travels up a distillation arm and floods into the chamber housing the thimble of solid.
- The condenser ensures that any solvent vapour cools, and drips back down into the chamber housing the solid material.



- The chamber containing the solid material slowly fills with warm solvent.
- When the Soxhlet chamber is almost full, the chamber is emptied by the siphon.
- This cycle may be allowed to repeat many times, over hours or days.
- During each cycle, a portion of the non-volatile compound dissolves in the solvent.
- After many cycles the desired compound is concentrated in the distillation flask.

Aqueous-alcoholic extraction by fermentation

- The extraction procedure involves soaking the crude drug, in the form of either a powder or a decoction for a specified period of time during which it undergoes **fermentation and generates alcohol.**
- Which facilitates the extraction of the active constituents available in crude drug.
- The alcohol thus generated also serves as a **preservative.**
- The fermentation is to be carried out in **an earthen vessel** water should be first boiled in the vessel

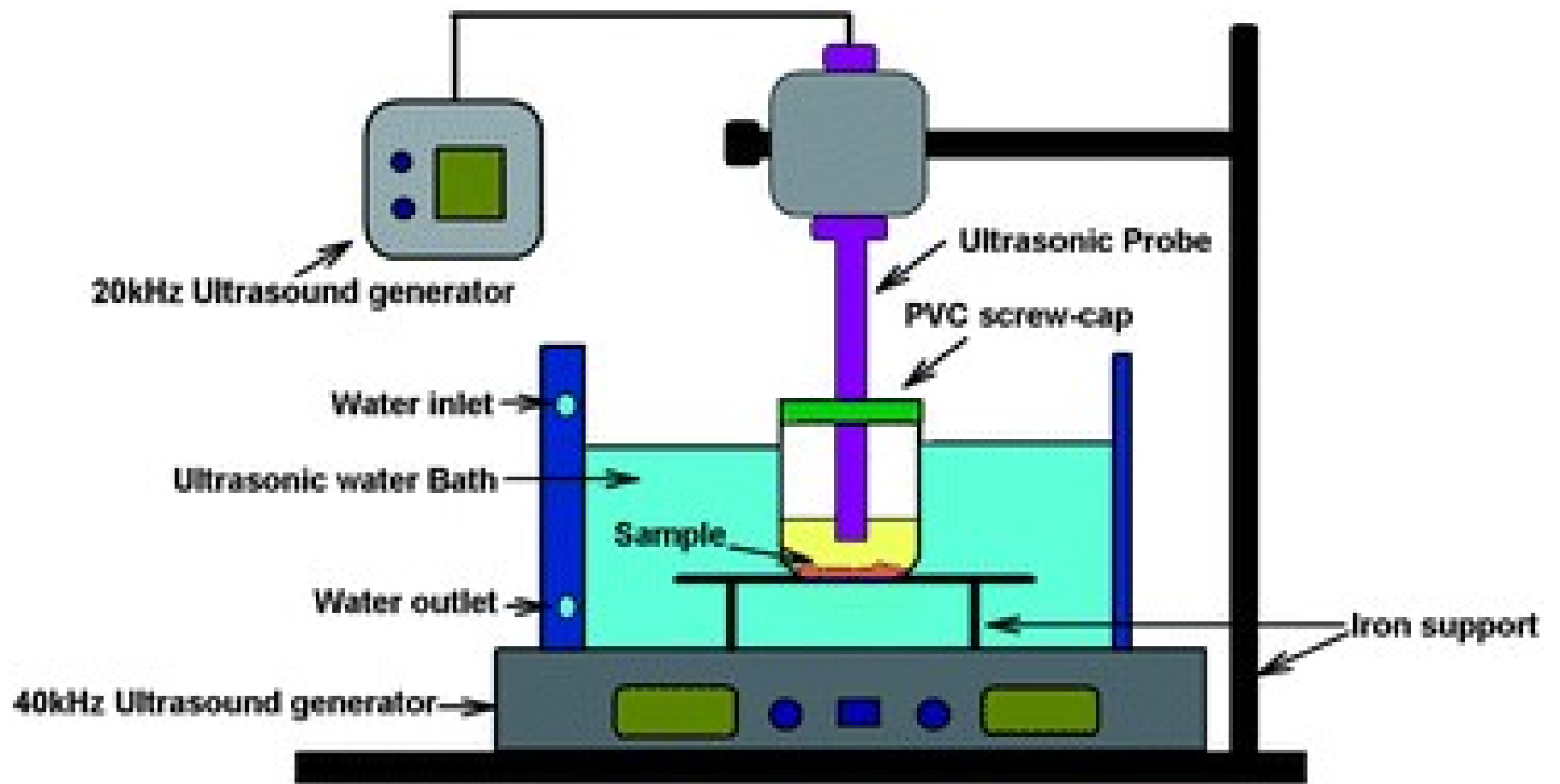
- In large-scale manufacture, **wooden vats**, porcelain jars or metal vessels are used in place of earthen vessels.
- Some medicinal preparations of Ayurveda (**like *asava* and *arista***) adopt the technique of fermentation for extracting the active principles.

Counter current extraction

- Counter current extraction is a type of **liquid-liquid extraction** and based on principle of **partition coefficient** i.e. the liquid to be isolated is much more soluble in either one of the two immiscible liquid.
- In this method wet raw material is **pulverized** using toothed disc disintegrators to produce **fine slurry**.
- The material to be extracted is moved in opposite direction of solvent within a cylindrical extractor.
- Finally sufficiently concentrated extract comes out at one end of the extractor while the marc (practically free of visible solvent) falls out from the other end

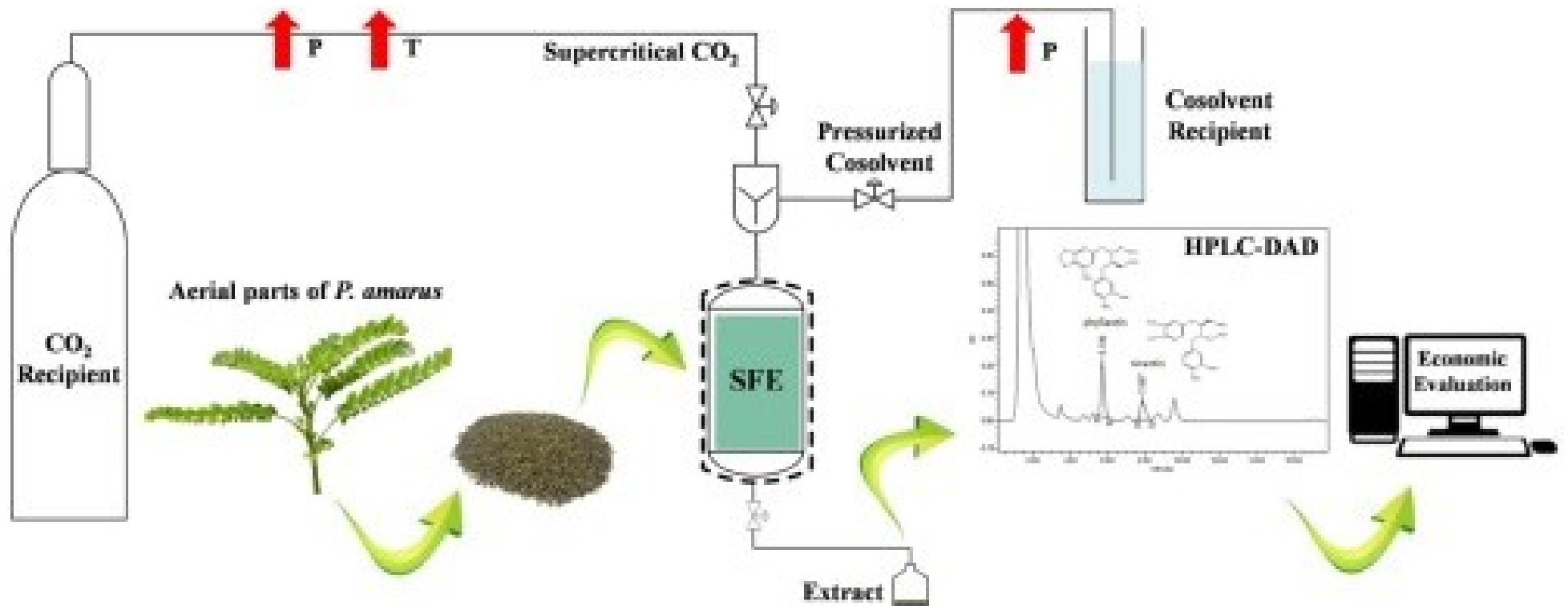
Ultrasound extraction (sonication)

- The procedure involves the use of ultrasound with **frequencies ranging from 20 kHz to 2000 kHz**; this increases the permeability of cell walls by inducing mechanical stress on cells which produces cavitation.
- Cavitation increases cell wall permeability and solublize maximum phytoconstituents very rapidly.
- One disadvantage of the procedure is that ultrasound energy may produce deleterious effect on the active constituents through formation of free radicals and consequently undesirable changes in the drug molecules.



Supercritical fluid extraction

- The critical point of a substance is **the highest temperature and pressure** at which substance has vapour- liquid equilibrium.
- Supercritical fluid have **liquid like density, gas like viscosity** and compressibility and higher diffusivities than liquid which facilitates extraction of wide variety of phytochemical.
- It is a process similar to simple extraction.
- Mostly **carbon dioxide** uses as extracting fluid because it is safe and abundant and has favorable physical properties.



Phytonic extraction (with hydro fluorocarbon solvents)

- **Advanced Phytonics Limited (Manchester, UK)** has developed this patented technology and termed as **phytonics process** which have significant environmental advantages and health and safety benefits over other extraction methods.
- It involves use of a new solvent **hydro fluorocarbon-134a** in place of **chloro fluorocarbons** to optimize fragrant oils, flavors and biological extracts.
- The new solvent is not flammable or toxic with less boiling point (25° C) and does not deplete the ozone layer.

THANK YOU