



# Medicinal Plants

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**Medicinal plants**, also called medicinal herbs, have been discovered and used in traditional medicine practices since prehistoric times. Plants synthesis hundreds of chemical compounds for functions including defence against nsects, fungi, diseases, and hcomponent extract erbivorous mammals.

- 75% of the world population depends on traditional herbal medicine
- In the United state 10% of all prescribed drugs have primary from plant
- 25% of our common medicine contain some compounds from plants



Recently, WHO (World Health Organization) estimated that 80 percent of people worldwide rely on herbal medicines for some aspect of their primary health care needs. According to WHO, around 21,000 plant species have the potential for being used as medicinal plants.

Treatment with medicinal plants is considered very safe as there is no or minimal side effects. These remedies are in sync with nature, which is the biggest advantage. The golden fact is that, use of herbal treatments is independent of any age groups and the sexes.

Medicinal plants are considered as a rich resources of ingredients which can be used in drug development either pharmacopoeial, non- pharmacopoeial or synthetic drugs. Apart from that, these plants play a critical role in the development of human cultures around the whole world. Moreover, some plants are considered as important source of nutrition and as a result of that they are recommended for their therapeutic values. Some of these plants include ginger, green tea, walnuts, aloe, pepper and turmeric etc. Some plants and their derivatives are considered as important source for active ingredients which are used in aspirin and toothpaste.



# Extraction

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.



*Aloe vera*



*Ocimum tenuiflorum*



*Tinospora cordifolia*

## Methodology



Cleaned, shade dried, mechanically grinded & coarsely powdered

## Preparation of extracts

Powdered material



Subjected to

Solvent extraction with hexane, acetone, methanol & water

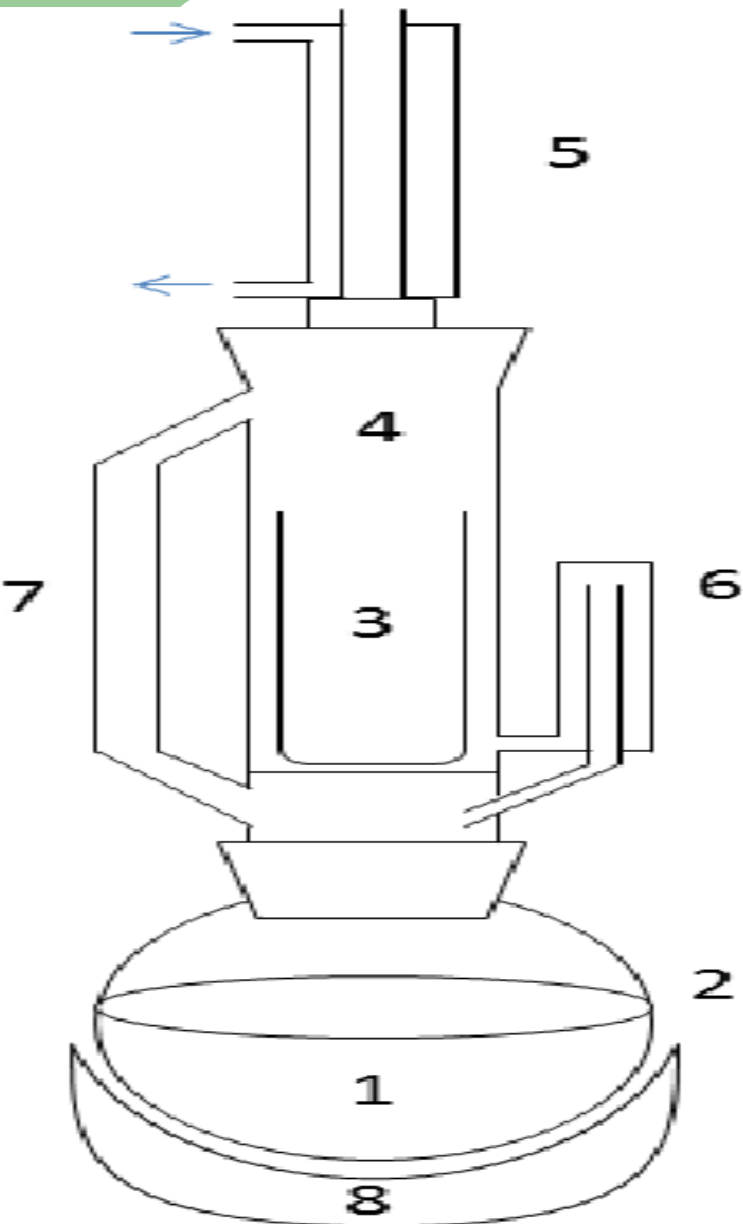


Extracts were concentrated using Rotary Evaporator



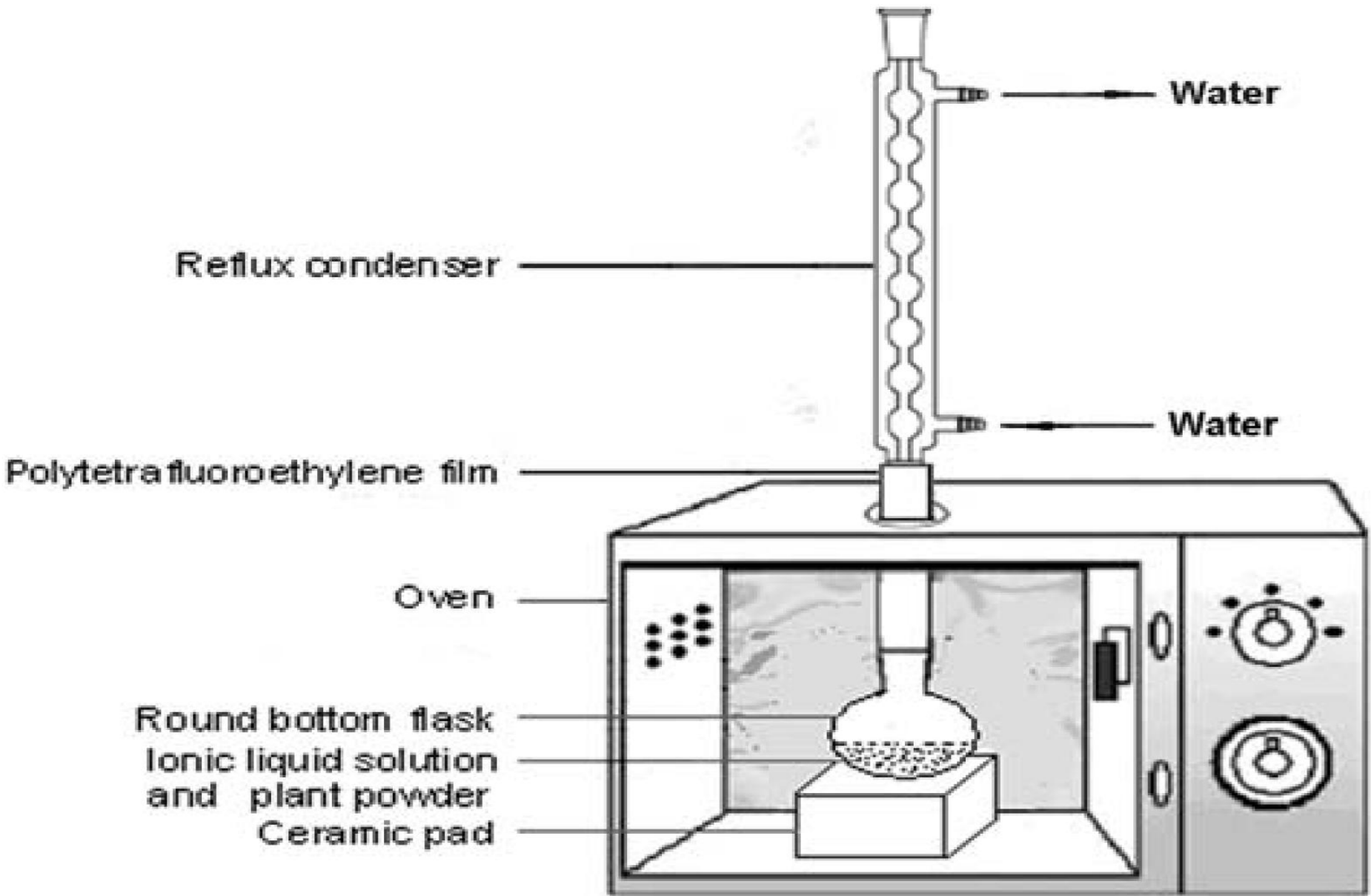
Phytochemical screening

## Sohxelet method



- 1 – Solvent (ethanol)
- 2 – Round bottom flask
- 3 – Soxhlet thimble
- 4 – Soxhlet extractor
- 5 – Condenser with running water
- 6 – Siphon
- 7 – Side arm (lagged with glass wool)
- 8 – Isomantle (heat source)

# Microwave assisted extraction method



## Advantages of Microwave Assisted Extraction :

- It reduces solvent consumption,
- It has a shorter operational time,
- It possess moderately high recoveries,
- Has a good reproducibility and minimal sample manipulation for extraction process.



## Disadvantages of Microwave Assisted Extraction:

- An additional filtration or centrifugation is necessary to remove the solid residue during MAE.
- Furthermore, the efficiency of microwaves can be very poor when either the target compounds or the solvents are non-polar, or when they are volatile.

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.



**Water** is one of the most suitable extractants.

It has several advantages:

1. Well penetrates through the cell membrane, impermeable to hydrophobic substances;
2. Water dissolves and extracts substance better than other liquids;
3. Pharmacologically indifferent;
4. Very common;
5. Combustible and explosion proof;
6. Available at cost.

# Water, as extractant has some negative properties:

1. Can not dissolve and can not extract hydrophobic substances;
2. Has not antiseptic properties, resulting in water extractions can develop micro-organisms;
3. Due to water is hydrolytic cleavage of many substances, especially while high temperature;
4. Enzymes can be split medicines in the aquatic environment.

# Characteristic of alcohol as extragent:

1. Is the solvent of many compounds not extracted by water, such as fats, alkaloids, chlorophyll, glycosides, essential oils, resins and others;
2. Has antiseptic properties (alcohol in aqueous solutions with concentration above 20 % do not develop bacteria);
3. The stronger alcohol, hydrolytic processes are the less possible in its environmental.
4. Alcohol inactivate enzymes;

Quite volatile, so alcohol extract is easy densities and dried to a powdery substance.

# Disadvantages of alcohol:

1. Is limited product, is sold by pharmaceutical production according to the law;
2. Much heavier than water. Penetrates through the cells walls and subtracts the water in proteins and mucous substances, converts them to sediments that clog cells pores, and therefore impairs the diffusion. Whether a lower concentration of alcohol, the easier it gets inside cells;
3. Is not pharmacologically indifferent, has both the local and general effect, which should be considered in the production of infusions;
4. Flammable.

## Extragents are used in the manufacture of herbal medicines

**Acetone** With water and organic solvents mixed in any ratio. Used as extragent for the alkaloids, resins, oils and others.

**Ethyl ether** mixed in all proportions with acetone, alcohol, ether, fatty oils and essential oils.

**Chloroform** is a good solvent for alkaloids, glycosides, oils, oils and more.

**Dyhloretan** is used for extracting glycosides.

**Methylene chloride** used for the extraction of hydrophobic substances (glycosides, alkaloids, etc)

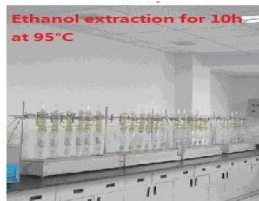
**Methanol, methyl or wood alcohol.** Mixed with water in all proportions. Strong poison. Use within 10 ml of substance causes atrophy of the optic nerve dose of 15 - 20 ml lethal.

**Vegetable oil.** Often used peach, almond and sunflower oil. Fatty oils are mixed with ether, chloroform, gasoline, mineral and essential oils.

**Liquefied gases:** carbon dioxide, propane, butane, liquid ammonia, chladone are promising for the extraction is proposed recently. Liquid carbon dioxide good extracts ether oils, fatty oils and other hydrophobic substances. Extraction by liquefied gases is conducted under vacuum.



500 herbs



Ethanol extraction for 10h at 95°C



Concentration and Enrichment



Library of stock solution



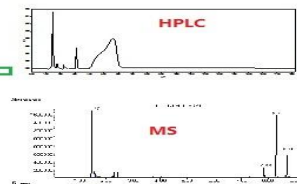
Pretreatment  
Centrifugation  
Filtration



Preparation of herbal fraction with RP-HPLC



<20 compounds per fraction



Quality control



Transfation



Library of dried fractions from herbs stored at -20°C



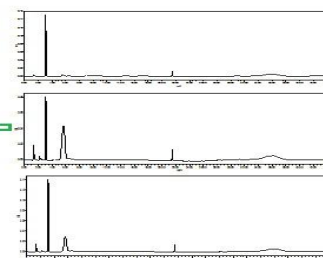
Library of fractions from herbal extract (dissolved in DMSO at 20µM)



Activity test on melanoma cells



Identification of target by analytical HPLC



Enrichment of the target



Further purification of the target

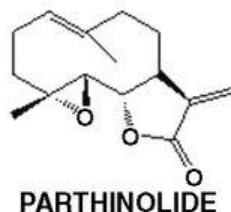


Active compound





## Sesquiterpenes compounds

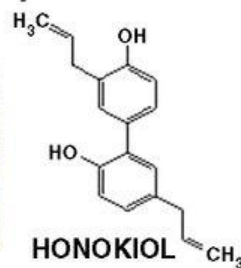


Tanacetum parthenium

## Flavonoids compounds



Magnolia grandiflora



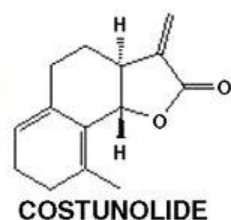
## Diterpenoids compounds



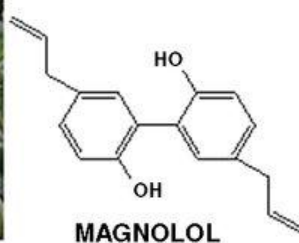
Isodon rubescens



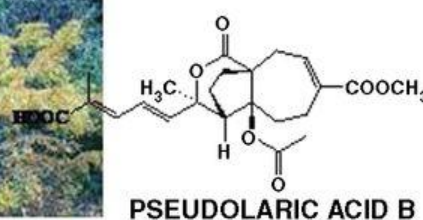
Inula helenium



Magnolia officinalis



Pseudolarix kaempferi



Inula helenium L.



Artemisia princeps



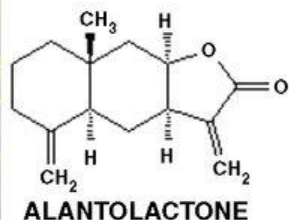
## Polyphenolic compound



Wedelia chinensis



Inula racemosa



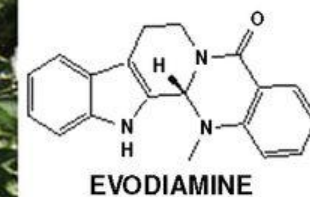
Vitex rotundifolia



## Alkaloid compound



Evodia rutaecarpa



## HPLC analysis



## HPLC preparative

