

## Extraction techniques of Medicinal plants

Extraction, as the term is used pharmaceutically, involves the separation of medicinally active portions or secondary metabolites such as (alkaloids, flavonoids, terpenes, saponins, steroids, and glycosides )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, semisolid or powders intended only for oral or external use. Medicinal plants are extracted and processed for direct consumption as herbal or traditional medicine or prepared for experimental purposes.

**Not**//The choice of solvent depends on :

- Type of plant, part of plant to be extracted
- Nature of the bioactive compounds
- Availability of solvent.

In general, polar solvents such as water, methanol, and ethanol are used in extraction of polar compound, whereas nonpolar solvents such as hexane and dichloromethane are used in extraction of nonpolar compounds.

Factors should be taken into consideration when choosing a solvent of extraction:

1. Selectivity.
2. Safety: should be nontoxic and nonflammable.
3. Cost :should be as cheap as possible.
4. Reactivity: should not react with the extract.
5. Recovery: should be quickly recovered and separated from the extract.
6. Viscosity : Should be of low viscosity to allow ease of penetration.
7. Boiling temperature :boiling temperature should be as low as possible to prevent degradation by heat

Factors to be considered befor extraction process:

1. Extraction condition
2. Nature of active constituents
3. Type of solvent

Methods of extraction can be divided into:

- Cold Methods
- Hot Methods.

### **Cold Methods :**

Is the process whereby a substance is extracted from a mixture via cold solvent. The procedure carried out at room temperature (15-25 °C). And its types:

1. Maceration
2. Percolation

### **Maceration**

Include soaking of plant material with the solvent until penetration of cellular structures and the active constituent softened and dissolved in the solvent. The procedure include placing the plant material in a container and adding the solvent with frequent agitation in a covered container and leave it for at least 3days.

**NOT//**The solvent used in extraction is usually dependent on the active constituent (alkaloids and glycosides), by using alcohol and water in different proportion.

- Water is used because if the alkaloids present in a salt form, they will dissolve in water.
- Non-polar solvent like chloroform are used for the extraction of volatile oil and terpenes.

Advantages of Maceration:

1. Can be used for heat sensitive substances.
2. Easy and cheap.

Disadvantages of Maceration:

1. Take a long time.
2. Non efficient.
3. Extract small quantities

## **Percolation**

In this method we are going to use a special apparatus which called percolator. The percolator has a filter at the bottom. The procedure includes placing the powder plant material in the percolator and start adding the solvent from the upper end. While the solvent going downward to extract as much as possible the active constituent, then passing through the filter. The addition of solvent stopped when the volume of solvent added reached 75% of the intended quantity of the entire preparations. The extract is separated by filtration followed by decantation. The marc is then expressed and final amount of solvent added to get required volume.

**Not//** The plant material is much better to be soaked by the solvent about 1/2 -4 hr. before starting the procedure which continue for 24h.

The solvent called menstrum and the extract we get it called percolate and the plant material left is called mark material.

Advantages of Percolation:

- We can use different types of solvents with different polarities to extract the active constituent.
- Used for heat sensitive substances.
- Easy and cheap.

Disadvantages of Percolation:

- Take a long time
- Large quantity of solvents
- Extract small quantities

## **Hot Extraction Methods**

- Infusion
- Digestion
- Decoction
- Continuous hot extraction methods
- Distillation

### **Infusion**

This is an appropriate method for preparation of fresh extract before use. The solvent to sample ratio is usually 4:1 or 16:1 depending on the intended use. The procedure involves placing the plant material in the infusion pot then we add the solvent which is cold or boiling water. These are dilute solutions of readily soluble components of crude drugs.

### **Digestion**

This is a form of maceration method in which the plant materials are placed together with the solvent and by application of gentle heat, so that the solvent will increase its power for extraction and this method is used in cases where moderately elevated temperature is required.

### **Decoction**

This is a typical method for preparation of Ayurvedic extracts. The crude drug is boiled in a specified water volume for a defined time with agitating until the active constituent will be dissolved in the solvent then filtered. This method is usually used for hard plant material like barks, stems and roots which contain a lot of fibers. The process is lasted for a short duration usually about 15min. The ratio of solvent to crude drug is usually 4:1 or 16:1.

- Here the solvent used depends on the active constituent and source of heat e.g. chloroform and ether can't be used because we use a direct source of heat.
- In addition to that the active constituent should be heat stable and water soluble.