

Significance of Medicinal Plants to Human Being

Healing with medicinal plants is an old treatment method as old as mankind itself. The connection between human and their search for drugs in nature dates from the far past. Awareness of medicinal plants' usage is a result of the many years of struggles against diseases and man learned to use drugs from barks, seeds, fruits, and other parts of the plants. Contemporary science has acknowledged and considered in modern pharmacotherapy the active actions of plant origin drugs, known by ancient civilizations and used throughout the ages. The knowledge of the development of ideas related to the usage of medicinal plants with awareness has increased the ability of pharmacists and physicians to respond to the challenges that have emerged with the spreading of professional services in simplifying the man's life.

Plant Secondary Metabolites:

These secondary metabolites or products exert in general a deep physiological effect on the mammalian system, thus are known as active principles of plants secondary plan. They are more limited in the plant kingdom and mostly accumulated by plant cells in smaller quantities than primary metabolites, which are essential for plant growth, development, stress adaptation, and defense.

The table below shows the differences between primary and secondary plant metabolites:

| Plant Primary Metabolites | Plant Secondary Metabolites |
|--|--|
| <p>1- Have metabolic functions essential for plant growth and development.</p> <p>2- Produce in every plant.</p> <p>3- Include: Carbohydrates, Organic acids, Amino acids, Fatty acids, Steroids and Vitamins.</p> | <p>1- Don't have apparent functions involved in plant growth and development.</p> <p>2- Produce in different plant families, in specific groups of plant families or in specific tissues, cells or developmental stages throughout plant development.</p> <p>3- Include: Terpenoids, special nitrogen metabolite including: (non-protein amino acids, amines glycosides, glucosinolates, alkaloids and phenols).</p> |

The plant material

- The freeing of the plant tissue under study from contamination:
 - a- Free from disease (microbial products, infection alter plant metabolism).
 - b- Free from other plants.
- Plants may be dried before extraction.
- Period of plant material storage e.g.: Myristicin content nutmeg, *Myristica fragrance* fruits increase slowly on storage, while the more volatile β -pinene content decrease with time.

Methods of extraction:

The precise mode of extraction naturally depends on texture and water content of the plant material being extracted and on the type of substance that is being isolated. In general, it is desirable to "kill" the plant tissue, i.e. prevent enzymatic oxidative or hydrolysis occurring.

The following general steps followed for plant secondary metabolites:



Extraction:

Extraction is the separation of medicinally mixture of many plant metabolites, such as alkaloids, glycosides, phenolics, terpenoids, and flavonoids using selective solvents through standard procedures. The aim of all solvent extraction methods is to separate the soluble plant metabolites, leaving behind the insoluble cellular contents. The following are the widely used extraction techniques.

1- Maceration, percolation, and decoction.

2- **Soxhlet** apparatus with a range of solvent such as, ether, petroleum and chloroform). This apparatus used for non-polar compound, lipids and sometimes starting with above solvent while using alcohol and ethyl acetate for more polar compounds.








3- **Clavenger** for oil extraction.

Concentration:

Extract can be concentrated by rotary evaporator. Otherwise, as a standard precaution against loss of material, concentrated extract should be stored in a refrigerator and trace of toluene added to prevent fungal growth.

(Mention other methods of concentrating the plant extract).

Differences between clavenger and rotary evaporator

-  **Steam distillation (clavenger)** is a technique by which slightly volatile, water-insoluble substance(s) is/are separated from non-volatile materials by means of steam.
-  The steam contacts a mixture & targets the substance (s) which have high boiling point(s), i.e., slight volatility, which are unmixable with water.
-  The steam carries the targeted substance (s) into another container through a condenser.
-  The product is collected in the receiving flask and will either contain 2 distinct layers (aqueous phase & organic phase) or it will be as an emulsion. The organic part may be an essential oil. If 2 layers form, the oil will be most probably in the upper layer. If there is an emulsion, then it is salted out first & a suitable organic solvent is then added to extract the oil.
-  **The rotary evaporator** functions by subjecting a mixture to heat which removes the volatile components fast by the action of vacuum & rotation.
-  The volatile components are condensed & collected.
-  In many cases, the rotary evaporator just concentrates a solution. We cannot place seeds in water & hope to get a significant amount of essential oils out by this equipment. The experiment may end up by collecting water (after it evaporates) & possibly very little oil, since it is less volatile, left with the seeds in the round-bottomed flask, if we are lucky.

Note:

All of extraction and concentration techniques tend to produce an extract with an aroma that differs from the aroma of the raw materials. Heat, chemical solvents or exposure to oxygen in the extraction process may denature some aromatic compounds, either changing their odor character or rendering them odorless, and the proportion of each aromatic component that is extracted can differ.

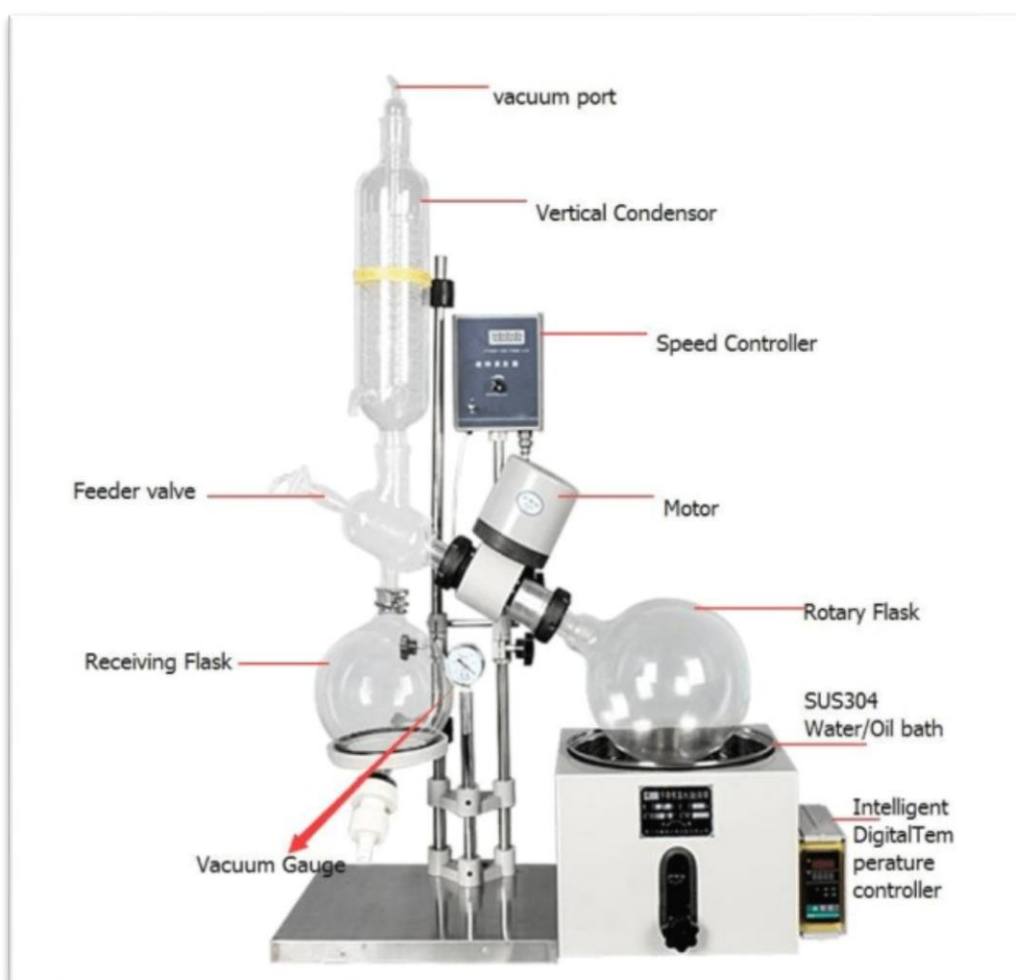


Figure 1: Rotary Evaporator