Introduction:

- Volatile oils are the odorous and volatile products of various plants.
- The are called volatile oils or ethereal oils as they evaporate when exposed to air at ordinary temperatures.
- They are also known as essential oils as they represent the *essences* or the odorous constituents of plants.

Volatile oils in plants functions as:

- helps in attracting different pollinating insects.
- it provides protection against insect, fungi, bacteria, and sometimes animals.
- Possess allelopathic property as germination inhibitors.

Chemical Composition

- They are aromatic complex mixtures of different groups of organic compounds called **terpenes.**
- Chemically, they are composed of hydrocarbons with generalformula (C_5H_8) and their oxygenated, hydrogenated and dehydrogenated derivatives.

Uses of volatile oils:

- In manufacturing of perfumes, cosmetics and cleaning products.
- In preparation of disinfecting agents with antiseptic properties.
- As antimicrobials for food preservation.
- Flavouring agents for foods, candies, gum, confectionary, toothpastes, and various pharmaceutical products.
- As insect repellent and green pesticides.
- In aroma therapy and massage therapy.

Green Methods of Preparation Of Volatile Oils

1. **Distillation:**

a) Water distillation

Firstly ,the dried plant material is immersed in water saturated with NaCl. Then, water is heated until boiling, and then the steam together with the Volatile Oil are condensed and received as two layers, one for water and the other for the Volatile Oil. Finally, cool and separate.

Disadvantages:

- Some compounds may be subjected to hydrolysis. e.g. esters.
- Complete exhaustion of the plant material is difficult as this process is insufficient for high boiling point compounds.

b) Steam distillation:

- It is used only for fresh plant material (especially for those containing oil in external secretory structures).
- The plant material is cut and transferred to a distilling chamber (suspended in a wire basket or perforated trays).
- Steam is forced through the plant material and the oil is obtained as before.
- Mostly used in the large scale production of volatile oil .

2. Expression methods:

- Before the discovery of distillation, all essential oils were extracted by pressing.
- These methods are used for preparation of V.O occurring in the rind of fruits, e.g. peels of orange, lemon, bergamot, etc.
- They are also the most suitable method for sensitive oils.

a) Sponge method:

- It is used on small scales and mainly for citrus fruits.
- The rind is squeezed in front of a sponge and then transferred to a vessel in which it is left for separation.

b) Scarification method:

The plant material, e.g. entire fruits, is transferred to a funnel of tinned copper in which the upper surface bears numerous strong pins to penetrate the outer layers of the fruits. The oil is collected and left to separate from the juice or the moisture.

c) Rasping process:

- A very old technique in which the peel containing the oil glands is removed by rasping with graters.
- The rasping are strongly pressed in bags of horse-hair and the oil is then collected.

d) Machines:

The most widely used expression method nowadays. Large amount of plant materials ar pressed by machines and the oil is obtained after centrifugation.

3. Extraction methods:

a) Extraction with volatile organic solvents:

- The plant material is extracted with certain organic solvents of low polarities, such as hexane, petroleum ether or benzene in a Soxhlet apparatus.
- The resulting extract is evaporated under reduced pressure leaving aresidue of volatile oil and other less polar compounds of the plant,e.g. Pigments and waxes. The obtained residue is known as floral concrete.
- The absolute oil is obtained by dissolving the floral concretes in absolute alcohol thus precipitating the albuminous materials, waxes, and pigments, followed by concentrating the alcoholic solution. The absolute is the most pure and expensive form of the oil.

4. Enzymatic hydrolysis:

- The powdered plant material is moistened with water at 40 °C for 24 hours. The volatile oil is released by enzymatic hydrolysis followed by steam distillation.

Examples:

1. Preparation of the volatile oil of bitter almond.
2. Preparation of the volatile oil of black mustard.