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Extraction of Essential Oils from Natural Sources

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ABSTRACT:

Essential oils from natural can be done by two methods i.e. by distillation and solvent extraction in a broad way which are also known as volatile oils or hydrophobic liquids. Distillation method further classified into Fractional Distillation, vacuum distillation, steam distillation, etc. Solvent extraction is done by using different organic polar solvents and non-polar solvent combination for phase distribution which leads to oil separation properly. This review explains specifically steam Distillation, Fractional Distillation and solvent extraction. The extract compositions were further analyzed by using FTIR, NMR and GC-MS techniques. It was found that solvent extraction is a better technique for extraction of essential oils as it provides better yield.

INTRODUCTION:

Essential oil is concentrated and hydrophobic liquid. It comprises of aromatic compounds, the organic constituents which may include hormones, vitamins and other natural elements [1]. Essential oils can be extracted from various plant parts like flowers, leaves, bark, roots, etc. Essential oils are highly volatile components. Essential oils find its applications in many ways. Biologically they show a profound effect on the Central Nervous System helping to relief stress, anxiety. Commercially essential oils are used in perfume industry. From medicinal perspective they are used in aromatherapy [2].

Nanotechnology & agriculture are going to play role in the future for extraction of essential oils [3-6]. Commercial use of

Essential Oils can be classified in following ways, **Flavors-**Used in bakery goods, candies, confectionaries etc. **Pharmaceuticals:** Used in dental products and wide but diminishing group of medicines. **Odorants:** Used in cosmetics, perfumes, soaps, detergents and industrial products[7].

Oil extraction can be carried out using distillation process which causes the plant tissues to break down which is disruptive technique. Therefore, this technique does not prove to be always useful. To overcome this failure another technique of extraction can be employed known as the SOLVENT EXTRACTION. Using this

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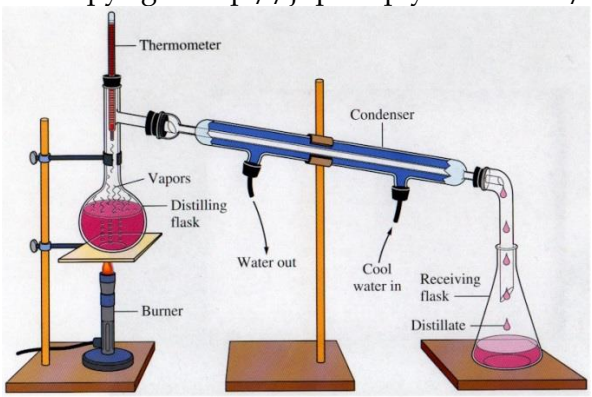
solvent vaporization technique gives rise to quasi-solid product called as concrete which contains fragrant compounds such as hydrocarbons, terpenes, etc.

Figure 1. Distilation unit – copyright-http://jupiter.plymouth.edu/~wwf/distillation.htm



METHODS

Distillation – Distillation is a process for separation of liquids present in a sample by using the difference in their boiling points. For a liquid component, vaporization is involved and for a solid sublimation is involved. All the substances whether solid or liquid are characterized by a specific vapor pressure. Vapor pressure can be defined as the pressure exerted by the substance against the external pressure (usually atmospheric pressure). It is also the measure of the tendency of a condensed substance to escape the condensed phase. More the vapor pressure, more will be the tendency to escape [8-9].

Types of Distillation

Steam Distillation: Steam distillation is used for temperature sensitive materials like naturally occurring aromatic compounds. The system for steam distillation process consists of two distillation slits, condenser and collector.

The material from which the essential oil is to be extracted (flower, bark, roots etc.) is placed in a distillation slit and steam is allowed to flow over the material. As a result of this hot steam, the botanical material starts to release the aromatic molecules. The volatile oil then escapes from the botanical material and evaporate into the steam. The steam temperature must be controlled in order to prevent

degradation of aromatic components.

The steam containing essential oils is then passed through a cooling system which allows the steam to condense. It forms a liquid from which the water and essential oils are then separated. Oil being lighter floats on the water surface. The two layers are separated using a separating funnel.

Solvent Extraction: Solvent extraction is a method which is based on the principle of relative solubility of analyte in two immiscible liquids. Most commonly used

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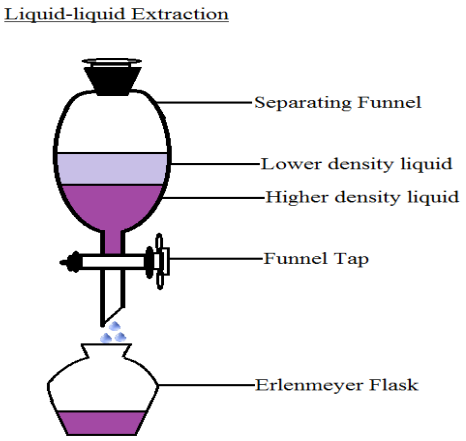
solvents for this technique are petroleum ether, hexane, methanol, ethanol.

Dry sample is weighed and placed in a flask. Solvent such as n-hexane is added to the sample and stoppered. It is allowed to stand for 72 hours. Then the extract is decanted into another beaker. Another solvent ethanol is added to the extract. The

essential oil is soluble in ethanol. The mixture is then separated by liquid-liquid separation technique. The solution is allowed to stand in a separating funnel. Then it is separated using the separating funnel. The components are separated on the basis of their densities. In hexane-ethanol system, the lower layer consists of ethanol whereas the upper layer consists of hexane. Separated layers are placed in a water bath. This removed the ethanol leaving behind the natural essential oil. The yield is determined by weighing extract on an electronic weighing balance.

Figure 2. Solvent extraction- (https://b16mcf0yrs1xyw6j2yl5vo18-wpengine.netdna-ssl.com/wp-content/uploads/2020/12/Liquid_liquid_extraction.png)



Results and Discussions:

The fractions from above analysis were analyzed by using FTIR, HMR and GC-MS techniques:

FTIR will confirm functional groups in the molecules as well as water or moisture in the compound. NMR will record with respect to ^{1}H NMR or ^{13}C NMR will record presence of protons and their position and carbon structure.

GCMS will give data about volatile molecules and also molecular mass of the unknown molecules.

CONCLUSION:

The amount of oil obtained from solvent extraction method was found to be greater than that which was obtained from steam distillation method. Thus, it can be concluded that solvent extraction is a better technique and cheaper as compared to distillation for extraction of essential oil.

Conflict of Interest: Authors declares no conflict of interest

Authors Contributions: Each and every author had contributed to the manuscript.

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