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Review Article

Review on extraction techniques for medicinal and aromatic plants

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ABSTRACT

The active ingredients and essential oils of aromatic and therapeutic plants can be extracted using a variety of techniques. The decision is based on how well the procedure fits the specific circumstances and whether it is economically feasible. The traditional techniques for making tinctures and galenicals from aromatic and therapeutic herbs are maceration, percolation, and infusion.

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1. Introduction

It possesses a large number of species of aromatic and medicinal plants, traditional knowledge that is well-documented, a long history of using traditional medicine, and the potential for the social and economic growth of aromatic and medicinal plants (MAPs)¹

2. Medicinal Plant Extracts²

Extraction, as 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.

2.1. General methods of extraction of medicinal plants^{3,4}

2.1.1. Maceration

In this procedure, the solvent is added to a stoppered container containing the whole or coarsely ground crude medication. The container is then let to stand at room temperature for at least three days, stirring often, until the soluble substance dissolves.

2.1.2. Infusion

The crude medication is macerated in boiling or cold water for a brief amount of time to create fresh infusions. These are diluted mixtures of the easily soluble components of unrefined medications.

2.1.3. Digestion

This type of maceration involves extracting the juice using a low amount of heat. When a somewhat higher temperature is acceptable, it is employed. This results in an increase in the menstruum's solvent efficiency.

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2.1.4. Decoction

This method involves boiling the crude medication for a predetermined amount of time in a given volume of water; it is then cooled and filtered or strained. This method works well for extracting components that are heat- and water-soluble.

2.1.5. Percolation

When making tinctures and fluid extracts, this process is most commonly used to extract active ingredients. The mass is packed and the top of the percolator is closed once the solid ingredients are moistened with an appropriate amount of the designated menstruum and left in a tightly covered container for approximately four hours. More menstruum is added to the mixture to form a shallow layer above the mass, and it is allowed to macerate in the closed percolator for 24 hours. The liquid inside the percolator is then allowed to trickle gently when the outlet is opened.

Menstruum is added as needed until the percolate contains roughly 75% of the total volume needed for the final product. The expressed liquid is mixed with the percolate after the marc is crushed. Menstruum is added until the desired volume is reached, and the mixed liquid is then purified by filtering, standing, and decanting.

3. Hot Continuous Extraction (Soxhlet)

Compared to previously published procedures, this one has the benefit of extracting significant amounts of medication with a much smaller amount of solvent. This has a significant economic impact on time, energy, and subsequently financial inputs. It is used exclusively as a batch process on a small scale, but when implemented on a medium or large scale as a continuous extraction procedure, it becomes much more cost-effective and feasible. (Figure 1).

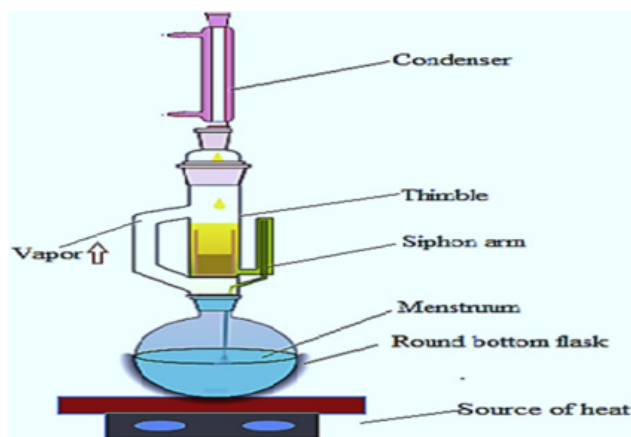


Figure 1: Hot continuous extraction (Soxhlet)⁵

4. Steps Involved in the Extraction of Medicinal Plants⁶

1. Size reduction
2. Extraction
3. Filtration
4. Concentration
5. Drying

5. Aromatic Plant Extracts⁷

5.1. Essential oils

Many consumer products, including detergents, soaps, toiletries, cosmetics, medications, fragrances, candy food items, soft drinks, hard drinks made from distilled alcohol, and insecticides, contain essential oils.

The oldest and most widely used techniques are water distillation, water and steam distillation, steam distillation, cohobation, maceration, and enfleurage. When there's a low oil yield from distillation, maceration can be adjusted. The most popular technique for making citronella oil from plant material is water distillation.

5.2. Resinoids

An extract of naturally resinous material made with a hydrocarbon solvent is called a resinoid. Typically, dry materials are used to produce resinoids. The extraction process is the same as that of producing concrete, with the exception that powder from dry plant material is fed into the extractor instead of material being stacked using perforated discs.

6. Maceration, Percolation and Infusion Techniques⁸

The common methods for obtaining medicinal plant extracts are maceration, percolation, and infusion; these methods are primarily utilized in galenical preparations. The only goal of these fundamental extraction techniques is to isolate the inert material with a menstruum-based selective solvent in order to extract the therapeutically desired portion. These methods are also crucial to the extracts' qualitative and quantitative evaluation. These extracts are currently utilized as sources of chemical constituents with therapeutic properties for different dosage forms of contemporary medications.

Nevertheless, these extraction techniques are still important and are included in both official and unofficial monographs about drug preparations because of the global interest in herbal drugs. Because they quickly form a deposit due to the coagulation of inert colloidal material and because they lack preservatives, the preparations involved in these procedures are primarily meant for extemporaneous dispensing and must be made fresh.

7. Factors Affecting the Choice of Extraction Process⁹

1. **Nature of the Crude Drug:**The kind and properties of the raw pharmaceuticals to be extracted are the main determinants of whether to utilize maceration or percolation. To get the optimal outcome, it is therefore crucial to understand the types of organs and tissues that make up the plant matter.
2. **Cost of the Crude Drug:**When the raw material is pricey (like ginger), it is preferable to achieve full extraction. Thus, from an economic perspective, percolation ought to be employed. Despite its reduced efficiency, maceration is acceptable for low-priced medications due to its cheaper cost.
3. **Solvent:**The solubility of the desired components of the material determines which solvent should be used. Continuous extraction should be utilized if the ingredients require a solvent other than an azeotrope or pure boiling solvent.
4. **Concentration of the Product:**One method of creating diluted items, such as tinctures, is maceration or percolation. The more effective percolation technique is employed for preparations that are semi-concentrated.

8. Quality Assurance: The Extraction Process and Solvent¹⁰

The kind of extraction process used also has a significant impact on the extract's qualitative and quantitative makeup. Several crucial aspects about the caliber of the extracts must be taken into account:

1. The more exhaustive the extraction, the better is the yield of the constituents from the herbal drugs.
2. The temperature, solvent volume, and length of the extraction process are other variables that affect extract quality.

9. Infusion

9.1. General considerations

Infusions are made from diluted, readily soluble crude medicinal substances. In the past, new infusions were made by macerating the medicine for a brief amount of time in either cold or hot water, then being diluted to eight volumes. A modified version of the maceration or percolation technique is used to create concentrated infusions. Concentrated infusions mimic the intensity and aroma of the comparable fresh infusion after being diluted with water. Infusions must be dispensed within 12 hours of preparation due to the possibility of bacterial and fungal development.

10. Plants Extracted by Maceration, Percolation and Infusion Techniques¹¹

10.1. *Vernonia amygdalina*

Tropical Africa is home to *Vernonia amygdalina*, a tiny shrub that belongs to the daisy family. Because of its bitter flavor, it is frequently referred to as bitter leaf in English. It is well known for being a medicinal plant that can be used to cure a variety of illnesses, such as diabetes, fever, headaches, and AIDS-related joint pain.

10.2. *Withania somnifera*

Withania somnifera, sometimes referred to as winter cherry or ashwagandha, is an evergreen shrub that grows in regions of Africa, the Middle East, and India. It is a member of the *Solanaceae* family, which includes nightshades. The plant has been utilized for generations in traditional Indian medicine, especially its powdered root. Despite being marketed as a dietary supplement and utilized in herbalism.

11. Conclusion

The method used to extract aromatic and therapeutic plants dictates how well we can enhance the bioresources of these plants. The method of extraction has an impact on both the external and internal makeup of essential oils. Even when the analytical data are within acceptable bounds, the batch may occasionally be rejected based just on its external look. Additionally, skilled perfumers assess essential oils on a global scale for their olfactory attributes, which are valued higher than analytical findings.

12. Source of Funding

None.

13. Conflict of Interest

None.

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