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A REVIEW ON; STANDARDIZATION OF HERBAL EXTRACTS.DEFINED CONCENTRATIONS OF ACTIVE CONSTITUENTS THROUGH ADVANCED EXTRACTION TECHNIQUES

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ABSTRACT

Introduction: Drug standardization entails confirming the drug's identity and assessing its purity and quality. Generally, herbal preparations imply the utilization of fresh or dried plant parts. The exact information on such raw drugs is vital in herbal remedies' making, safety, and efficiency. The active ingredients of crude pharmaceuticals are currently estimated using various techniques, including botanical, chemical, spectroscopic, and biological methods, in addition to their physical constants, as a result of advances in our understanding of their chemical makeup. Plants have been used in *Ayurveda* to treat a variety of illnesses. In this assessment, an effort has been made to summarize some Extraction techniques including the separation of medicinally active parts of plant organisms from the inert components using specific solvents. The type of solvent utilized in the extraction technique greatly influences the systematic research of plant species to discover new bioactive components and successfully evaluate biologically active substances from plant parts. **Methodology:** Researchers have traditionally found it difficult to extract the bioactive plant components**.** The standard strategies of medicinal plant extraction comprise maceration, infusion, percolation, digestion, decoction, hot continuous extraction, aqueous-alcoholic extraction through fermentation, counter-current extraction, microwave-assisted extraction, ultrasound extraction (sonication), supercritical fluid extraction, photonic extraction, etc. components using specific solvents. **Result:** Attempts to provide an overview of specific extractants and extraction procedures, along with their benefits and drawbacks. **Discussion:** Herbal medicines have few or no side effects, making them the best choice over current synthetic drugs Because of this, researchers are focusing on evaluating and characterizing different plants and plant elements against various ailments based on the traditional claims made by *Ayurvedic* herbs. Efforts must be made to develop batches that are as pleasant and consistent as possible while adhering to the best extraction procedures.

KEYWORDS: Extraction procedure, Solvent, Screening, Phytochemicals, Herbal products, Quality, Purity, and Standardization.

➢ INTRODUCTION

The plant was used as a medicine in ancient. Different plant parts are the origin of large amounts of drugs and are also used by tribal people throughout the world. It is now assumed that nature has given the remedies for every disease in one way or another. As per Ayurveda plants are used to alleviate various diseases. [Ncube et al., 2008]. Herbal medicines include herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants, other plant materials, or combinations as active ingredients. Standardized herbal extracts are a preparation, which contains a certain fixed proportion of the active constituent. For example, a standardized extract of Papaver somniferum contains not less than 9.5% of morphine. The concept of standardization has a great impact on the quality of herbal products. Standardization helps in adjusting the herbal drug formulation to a defined content of a constituent or constituents with therapeutic activity. The commonly employed technique for the removal of active substances from the crude drug is called extraction. Extracts are prepared by separating the soluble matter from vegetable tissues by application of a suitable solvent. The resultant liquid is concentrated by evaporation to obtain a liquid extract or concentrated nearly to dryness to obtain the solid extract. In herbal medicines where the active ingredients have been identified, the preparation of these medicines should be standardized to contain a defined amount of the active ingredients, if adequate analytical and extraction methods are available then we will able to collect medically active ingredients.

❖ METHODOLOGY

➢ **Need of standard pharmacopeia:** The references included in pharmacopeia verify the purity, quality, and authenticity of herbal medications. The pharmacopeia establishes numerical values for the medications and structural, analytical, and physical standards. Specific tests for certain plant materials i.e. Volatile oil content, hemolytic activity foaming index, bitter value, tannin content, Fat content, Acid value, Saponification value Iodine value, etc.

➢ **Selection of solvent:** There are a large number of solvents (menstrum) used for the extraction of drugs but the selection of a suitable solvent capable of extracting the active constituents depends upon the chemical properties of active constituents as well as the qualities of the solvent. The solvents commonly used for the extraction of drugs include water, alcohol, and their different dilutions.

➢ **Good solvent in plant extractions**

- Low toxicity.
- Evaporate at low temperature.
- Rapid physiologic absorption of the extract.
- Preservative action.

The solvent should be harmless and shouldn't affect the bioassay because the final result will contain traces of leftover solvent.

Table 1: Solvents used for Extraction. [Cowan, 1999].

Water	Ethanol	Methanol	Chloroform	Ether	Acetone
Anthocyanins Starches Tannins Saponins Terpenoids Polypeptides Lectins	Tannins Polyphenols Polyacetylenes Flavonols Terpenoids Sterols Alkaloids	Anthocyanins Terpenoids Saponins Tannins Xanthoxyllines Totarol Lactones	Terpenoids Flavonoids	Alkaloids Terpenoids Coumarins Fatty acids	Phenol Flavonoids

➢ **Extraction:** Extraction, as the term is used in pharmaceuticals, includes the separation of medicinally active quantities of plant or animal tissues from inactive or inert components through the use of selective solvents in trendy extraction strategies.

Parameters influencing the quality of an extract: The fundamental parameters influencing the excellent of an extract are [Ncube et al., 2008; Ahamed et al., 2013]

a) Plant part used as starting material
b) Solvent used for extraction
c) Extraction procedure.

➢ **Extraction techniques:** Extraction of crude drugs can be done by various processes depending on the physical nature of the drug and the chemical properties of the constituents present in it. Various methods used for the extraction of drugs include

1) Infusion
2) Decoction
3) Digestion
4) Maceration
5) Percolation.
6) Plant tissue homogenization.
7) Serial exhaustive extraction
8) Soxhlet extraction
9) Sonication.

1. Infusion: It is a diluted mixture of the highly soluble ingredients found in crude medications. Macerating the particles with either cold or boiling water for a brief amount of time creates fresh infusions. [Remington, 2006; Ahmad et al., 2013].

2. Decoction: This process involves boiling a crude medication in water for 15 minutes, chilling it, straining it, and then flowing enough cold water through it to create the necessary volume 121 in order to extract the water-soluble and heat-stable components. [Remington, 2006; Tiwari et al., 2011].

3. Digestion: This type of maceration involves applying a small amount of heat throughout the extraction process. Because it increases the menstrual solvent efficiency, it is employed when a slightly higher temperature is acceptable. [Remington, 2006].

4. Maceration: Maceration (for fluid extract) involves agitating a plant drug, either whole or coarsely powdered, frequently while it is in contact with the solvent in a stoppered container for a predetermined amount of time until the soluble material dissolves. When it comes to thermolabile medications, this approach works well. [Tiwari et al., 2011; Ahamed et al., 2013].

5. Percolation: The most common method for removing active components from tinctures and fluid extracts is this one. Typically, a narrow, cone-shaped jar with open ends is called a percolator. The mass is packed, and the percolator's top is sealed after the solid ingredients are moistened with a suitable quantity of the designated menstruum and left to stand for around four hours in a tightly sealed container. After adding more menstruum to create a shallow layer above the mass, the mixture is left to macerate for twenty-four hours in the closed percolator. After that, the percolator's outlet is opened, allowing the liquid inside to slowly trickle. As needed,

more menstruum is added until the percolate equals around three-quarters of the final product's volume. The expressed liquid is then added to the percolate after the marc has been squeezed. After adding enough menstruum to create the necessary volume, the combined liquid is either filtered or allowed to stand before being decanted to clarify it.[Handa et al., 2008].

6. Plant tissue homogenization: Researchers have frequently used solvent-based plant tissue homogenization. The extract is filtered after the fresh plant components, whether wet or dried, are ground into tiny particles in a blender, combined with a certain amount of solvent, and agitated violently for 5–10 minutes or left for 24 hours. The concentration can then be ascertained by resolving the filtrate in the solvent and drying it under lower pressure. However, to clarify the extract, some studies centrifuged the filtrate (Das, 2010).

7. Serial exhaustive extraction: To guarantee that a broad range of compounds with varying polarities can be extracted, this popular extraction technique entails serial extraction using solvents of increasing polarity, starting with a non-polar solvent (hexane) and ending with a more polar solvent (methanol). Some researchers use organic solvents for soxhlet extraction of dried plant material. Since prolonged heating may cause compounds to degrade, this approach cannot be applied to thermolabile chemicals [Das, 2010; Tiwari et al., 2011].

8. Soxhlet extraction: Only when the impurity is insoluble in a solvent and the target product has limited solubility in that solvent is Soxhlet extraction necessary. A straightforward filtration procedure can be used to separate the target component from the insoluble material if it is highly soluble in a solvent. The benefit of this approach is that only one batch of solvent is recycled rather than numerous parts of heated solvent being passed through the sample. Because prolonged heating might cause compounds to degrade, this approach cannot be applied to thermolabile substances.[Swami et al., 2008].

9. Sonication: Ultrasound with frequencies between 20 kHz and 2000 kHz is used in the operation; this causes cavitation and enhances the permeability of cell membranes. Even though the method works well in certain situations, such as when rauwolfia root is extracted, its widespread use is constrained by its higher expenses. One drawback of the process is the known but infrequent harmful impact of ultrasonic energy (more than 20 kHz) on medicinal plant active ingredients, which results in the production of free radicals and unfavorable alterations in the drug molecules. [Handa et al., 2008].

Variation in extraction techniques normally depends upon

1) Solvent used
2) Length of the extraction period
3) pH of the solvent
4) Temperature
5) Particle size of the plant tissues
6) The solvent-sample ratio [Das, 2010]

Factors affecting extraction methods: The variations in different extraction methods that will affect the quantity and secondary metabolite composition of an extract depend upon [Ncube et al., 2008; Tiwari, 2011].

1) Type of extraction
2) Time of extraction
3) Temperature
4) Nature of solvent
5) Solvent concentration
6) Polarity

RESULT

Attempts to provide an overview of specific extractants and extraction procedures, along with their benefits and drawbacks. Standardized herbal extracts prepared from Indian medicinal plants contain.

Medicinal Herbs	Active Constituents
Allium sativum	Allicin 0.6%
Andrographis paniculata	Andrographolide 10%
Asparagus racemosus	Saponin 30%
Azadirachita indica	Azadiractin 2%
Adhatoda vasica	Vasicine 0.5%
Bacopa monneri	Bacoside 20%
Boswellia seratta	Boswellic Acid 40% & 70%
Commiphora mukal	Guggul-sterones 5%

DISCUSSION

Herbal medicines have few or no side effects, making them the best choice over current synthetic drugs Because of this, researchers are focusing on evaluating and characterizing different plants and plant elements against various ailments based on the traditional claims of *Ayurvedic* herbs. Efforts must be made to develop batches that are as pleasant and consistent as possible while adhering to the best extraction procedures. The Ayurvedic Pharmacopoeia of India's pharmacopoeial requirements are insufficient to guarantee the quality of plant materials since the materials are not in a state that permits efficient microscopic inspection when they are received at the manufacturing facility. Extraction methods that are not standardized could cause differences and the breakdown of the phytochemicals

found in the plants. The best extraction techniques should be developed and followed, and batches of quality should be produced as consistently as possible.

CONCLUSION

- The purpose of preferring modern extraction methods is that it can be carried out in a shorter time compared to traditional extraction methods, with low energy consumption and using less solvent, with an economical and environmentally friendly sensitivity.
- Chemical analysis of extracts from plant material plays a central role in the development and modernization of herbal medicine.
- More research is needed to improve the design and scale-up of the novel extraction systems for their better industrial applications.
- Single medicinal plants are used in various diseases by extracting their best active phytoconstituents.
- Due to the low availability of some medicinal plants.

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