

REVIEW ARTICLE ON : ADVANCE HERBAL TECHNOLOGY**Mr. Sachin Niwas Pawar, Mr. Shrihari Dadasaheb Garje**

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Abstract

Recently peoples are getting attracted towards herbal medicines due to many advantages. Herbal formulations have reached extensive acceptability as therapeutic agents for several diseases. Although, most of these applications are unorthodox, it is however a known fact that over 80% of the world population depends on herbal medicines and product for healthy living. This rise in the use of herbal product has also given rise to various forms of abuse and adulteration of the products leading to consumers' and manufacturers' disappointment and in some instances fatal consequences. The development of authentic analytical methods which can reliably profile the phytochemical composition, including quantitative analyses of marker/bioactive compounds and other major constituents, is a major challenge to scientists. Standardization is an important step for the establishment of a consistent biological activity, a consistent chemical profile, or simply a quality assurance program for production and manufacturing of herbal drugs. In present review article various convectional methods as well as newer advances are described. Recent advancements includes DNA fingerprinting, metabolomics technique, differential pulse polarography, chemometric, X-ray diffraction etc. are observed. Capillary electrophoresis and chromatographic techniques contributions towards standardization of herbal drugs is also reported.

Course content**Module 1:****Identification, Authentication and Extraction of Herbs****Introduction to herbal technology**

Medicine is a substance that has nutritive, curative, or preventive properties, while the term "herbal" refers to a botanical or plant-based preparation. Hence, the term "herbal medicine" is used for plantbased substances that consist of nutritive, curative, or preventive properties. Herbal medicine is an interdisciplinary branch between herbal medicine and Ayurveda as it covers all fields of herbal medicine related to botany, medicinal plant research, pharmacognosy, phytochemistry, phytotherapy, botanical medicines, Ayurveda, natural chemistry, agriculture science, Unani medicine, biotechnology, and biochemistry. A person who deals with herbs, especially medicinal herbs, is known as an herbalist. Herbal journals deal with the use of plants in the treatment of diseases.

Different methods of Identification of plants

(1).Expert Determination: The best method of identification is expert determination in terms of reliability or accuracy. In general the experts have prepared treatments (monographs,

revisions, synopses) of the group in question, and it is probable that the more recent floras or manuals include the expert's concepts of taxa.

Experts are typically found in botanical gardens, herbaria, museums, colleges, universities, etc. However, although of great reliability, this method presents problems of requiring the valuable time of experts and creating delays for identification.

(2) Recognition: It approaches expert determination in reliability. This is based on extensive, past experience of the identifier with the plant group in question.

(3) Comparison: A third method is by comparison of an unknown with named specimens, photographs, illustrations or descriptions. Although this is a reliable method, it may be very time consuming or virtually impossible due to the lack of suitable materials for comparison.

4) The Use of Keys and Similar Devices (Synopses, Outlines, etc.): This is by far the most widely used method and does not require the time, materials, or experience involved in comparison and recognition

□ **Different extraction methods including advanced extraction techniques like supercritical fluid**

Extraction-can be defined as the removal of soluble material from an insoluble Residue, either liquid or solid, by treatment with a liquid solvent.

The principle methods of extraction are-

- Maceration
- Percolation

- Digestion
- Infusion
- Decoction

Solvent extraction also known as liquid-liquid extraction and partitioning, is a Method to separate compounds based on their relative solubilities in two different Immiscible liquids, usually water and an organic solvent. It is an extraction of a substance From one liquid phase into another liquid phase. It is a basic technique in chemical Laboratories, where it is performed using a separatory funnel. In other words, this is the Separation of a substance from a mixture by preferentially dissolving that substance in a Suitable solvent.

Solvent extraction may be made use analytically for concentrating or Rejecting a particular substance, or for the separation of mixtures. This process usually Separates a soluble compound from an insoluble compound. Solvent extraction is used in Nuclear processing, ore processing, production of fine organic compounds, processing of Perfumes and other industries.

Supercritical fluid extraction

Often the analysis of complex materials requires, as a preliminary step that is, Separation of the analyte or analytes from a sample matrix. Ideally, an analytical separation Method should be rapid, simple and inexpensive; should give quantitative recovery of Analytes without loss or degradation; should yield a solution of the analyte that is sufficiently Concentrated to permit the final measurement to be made without the need for concentration; Should generate little or no laboratory wastes that have to be disposed off. For many years,

one of the most common methods for performing analytical separations on complex environmental, pharmaceutical, food and petroleum samples was Based upon extraction of bulk samples with hydrocarbon or chlorinated organic solvents Using a Soxhlet extractor. Unfortunately, liquid extraction frequently fails to meet several of The ideal criteria.

Module 2-

Isolation and purification technique

A.General isolation techniques

1.Extraction methods

2.Plant material extraction is a crucial process in the isolation of natural plant compounds and their purification.

3.Plant matrices naturally are complex, containing a wide range of compounds that have various physical and

4.chemical properties [8]. It is therefore imperative to carefully, isolate from the rest of the plant, matrices.

5.make pure, compounds of interest in plants for their characterization. There are several ways extraction methods

6.can be categorized [9]. In this chapter, they have been categorized based on the temperatures they work under.

7.(2.1)Low or room Temperature methods

8.(2.1.1) Cold extraction method

9.The method has been described in literature [10, 11]. Briefly, dried plant parts samples (Cut, crushed or milled)

CHROMATOGRAPHIC TECHNIQUES IN HERBAL DRUG ANALYSIS

Chromatography represents the most versatile separation technique and readily available. Chromatography is Defined as technique of isolation and identification of components or compounds or mixture of it's into individual Components by using stationary phase and mobile phase. Plant materials are separated and purified by using various Chromatographic techniques. Herbal medicine is a complicated system of mixtures. Thus, the methods of choice for Identification of botanical drug' are mainly intended to obtain a characteristic fingerprint of a specific plant that Represent the presence of a particular quality defining chemical constituents. Chemical fingerprints obtained by chromatographic technique and especially by hyphenated chromatography, are Strongly recommended for the purpose of quality control of herbal medicines, since they might represent Appropriately the "chemical integrities" of the herbal medicines and therefore be used for authentication and Identification of the herbal products. Thin layer chromatography (TLC) and High Performance Thin Layer Chromatography (HPTLC)

3)Thin Layer Chromatography

Thin layer chromatography is simply known as TLC. It is one of the most popular and simple chromatographic Technique used of separation of compounds. In the phytochemical evaluation of herbal drugs, TLC is being Employed extensively for the following reasons:

1. It enables rapid analysis of herbal extracts with minimum sample cleanup requirement,
2. It provides qualitative and semi quantitative information of the resolved compounds.
3. It enables the quantification of chemical constituents. Fingerprinting using HPLC and GLC is also carried out in-

Column chromatography

Column chromatography in chemistry is a chromatography method used to isolate a single chemical compound from a mixture. Chromatography is able to separate substances based on differential adsorption of compounds to the adsorbent; compounds move through the column at different rates, allowing them to be separated into fractions. The technique is widely applicable, as many different adsorbents (normal phase, reversed phase, or otherwise) can be used with a wide range of solvents. The technique can be used on scales from micrograms up to kilograms. The main advantage of column chromatography is the relatively low cost and disposability of the stationary phase used in the process. The latter prevents cross contamination and stationary phase degradation due to recycling. Column chromatography can be done using gravity to move the solvent, or using compressed gas to push the solvent through the column.

High Performance Thin Layer Chromatography (HPTLC)

HPTLC technique is widely employed in pharmaceutical industry in process development, identification and Detection of adulterants in herbal product and helps in identification of pesticide content,

mycotoxins and in quality Control of herbs and health Food. It has been well reported that several samples can be run simultaneously by use of A smaller quantity of mobile phase than in HPLC. It has also been reported that mobile phases of pH 8 and above Can be used for HPTLC. Another advantage of HPTLC is the repeated detection (scanning) of the chromatogram With the same or different conditions. Consequently, HPTLC has been investigated for simultaneous assay of several Components in a multicomponent formulation. With this technique, authentication of various species of plant is Possible, as well as the evaluation of stability and consistency of their preparations from different manufactures. Various workers have developed HPTLC method for phytoconstituents in crude drugs or herbal formulations suchas Bergenin, catechine and gallic acid in *Bergenia cilliata* and *Bergenia lingulata*

High performance liquid chromatography (HPLC)

The separation principle of HPLC is based on the distribution of the analyte (sample) between a mobile phase (eluent) and a stationary phase (packing material of the column). Depending on the chemical structure of the analyte, the molecules are retarded while passing the stationary phase. The specific intermolecular interactions between the molecules of a sample and the packing material define their time “on-column”.

Hence, different constituents of a sample are eluted at different times. Thereby, the separation of the sample ingredients is achieved. A detection unit (e.g. UV detector) recognizes the analytes after leaving the column.

Purification techniques for isolated phytoconstituents

The separation of phytochemicals is a process of isolating the constituents of plant extracts or effective parts one by one and purifying them into monomer compounds by physical and chemical methods.

This section describes the common methods and their specific applications in isolation of phytochemicals.

1. Acid and basic solvent method-

The acid and basic solvent method for phytochemicals utilizes liquid-liquid extraction, where compounds are selectively dissolved into an aqueous layer by adjusting the pH with an acid or base to convert them into water-soluble salts. By carefully selecting the pH, an organic acid can be drawn into the aqueous phase under basic conditions (as a salt), while a basic compound can be drawn into the aqueous phase under acidic conditions (as a salt). After extraction, the desired neutral compound can be recovered from the aqueous phase by re-adjusting the pH. The acid and basic solvent method for phytochemicals utilizes liquid-liquid extraction, where compounds are selectively dissolved into an aqueous layer by adjusting the pH with an acid or base to convert them into water-soluble salts. By carefully selecting the pH, an organic acid can be drawn into the aqueous phase under basic conditions (as a salt), while a basic compound can be drawn into the aqueous phase under acidic conditions (as a salt). After extraction, the desired neutral compound can be recovered from the aqueous phase by re-adjusting the pH.

2. A polarity gradient extraction method-

A polarity gradient extraction method for phytoconstituents involves a sequential extraction of plant material with solvents of increasing polarity, such as n-hexane, ethyl acetate, and ethanol or methanol, to isolate compounds based on their varying affinities. This technique, often combined with methods like sonication-assisted maceration, allows for the separation of non-polar, semi-polar, and polar compounds, which can then be further analyzed to identify specific phytoconstituents.

3. precipitation method-

It is a method based on the formation of precipitation of some phytochemicals by reaction with specific reagents, or the precipitation of some components from the solution by adding specific reagents, which can reduce the solubility of some components in the solution. The precipitation reaction must be reversible if the target components are required to form precipitation. While if the components are nontarget, the precipitation generated will be removed, so the precipitation reaction can be irreversible. According to the addition of reagents or solvents, this method could be classified as follows. In the mixed component solution, the polarity can be changed by adding a specific solvent that is mutually soluble with the solution, so it can be precipitated from the solution. The gradual precipitation by changing the polarity or amount of solvent added is called fractional precipitation. For example, using water as an extracting solvent to extract phytochemicals, ethanol is added to the water extracting concentrate to make its alcohol content more than 80%,

and then polysaccharides, proteins, starch, gum, and so on will be precipitated and removed after filtration. The preceding procedure is called water extraction and ethanol precipitation. Crude polysaccharides from plants are often separated with this method.

Module 3-

Importance of standardization STANDARDIZATION OF HERBAL FORMULATION

Standardization of herbal formulation requires Implementation of Good Manufacturing Practices(GMP).In addition, study of various Parameters such as pharmacodynamics, Pharmacokinetics, dosage, stability, self-life, toxicity , Evaluation, chemical profiling of the herbal Formulations is considered essential. Other factors Such as pesticides residue, aflatoxine content, heavy Metals contamination, Good Agricultural Practices (GAP) in herbal drug standardization are equally Important.

STANDARDIZATION OF POLYHERBAL FORMULATION

Standardization is an important aspect for Maintaining and assessing the quality and safety of The polyherbal formulation as these are combinations Of more than one herb to attain the desire therapeutic Effect. Standardization minimizes batch to batch Variation; assure safety, efficacy, quality and Acceptability of the polyherbal formulations . The Standardization of various marketed herbal and Polyherbal

formulation Madhumehari Churna (Baidynath) containing the mixture of eight Herbal.

Dashamularishta, a traditional formulation, Used in the normalization of physiological processes After child birth. TLC and HPTLC fingerprint Profiles were used for deciding the identity, purityand Strength of the polyherbal formulation and also for Fixing standards for this Ayurvedic formulation.

STANDARDIZATION AND QUALITY CONTROL OF HERBAL CRUDE DRUGS –PARAMETERS

According to WHO (1996a and b, 1992), Standardization and quality control of herbals is the Process involved in the physicochemical evaluation Of crude drug covering aspects, such as selection and Handling of crude material, safety, efficacy and Stability assessment of finished product, Documentation of safety and risk based on Experience, provision of product information to Consumer and product promotion. Attention is Normally paid to such quality indices such as: supplements may not change your habits of procrastination. Therefore, daily brain exercises are also required to boost brain capabilities. capabilities. In Ayurveda, Shankhpushpi has been given the status of a nerve tonic. The reason is that it contains elements such as tryptanoids, flavonol glycosides, anthocyanins, and steroids.

Conclusion

Plants, herbs, and ethnobotanicals have been used since the early days of humankind and are still used throughout the world for health promotion and

treatment of disease. Plants and natural sources form the basis of today's modern medicine and contribute largely to the commercial drug preparations manufactured today. About 25% of drugs prescribed worldwide are derived from plants. Still, herbs, rather than drugs, are often used in health care. For some, herbal medicine is their preferred method of treatment. For others, herbs are used as adjunct therapy to conventional pharmaceuticals. However, in many developing societies, traditional medicine of which herbal medicine is a core part is the only system of health care available or affordable. Regardless of the reason, those using herbal medicines should be assured that the products they are buying are safe and contain what they are supposed to, whether this is a particular herb or a particular amount of a specific herbal component. Consumers should also be given science-based information on dosage, contraindications, and efficacy. To achieve this, global harmonization of legislation is needed to guide the responsible production and marketing of herbal medicines. If sufficient scientific evidence of benefit is available for an herb, then such legislation should allow for this to be used appropriately to promote the use of that herb so that these benefits can be realized for the promotion of public health and the treatment of disease.

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