IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

Advanced Herbal Technology

P. H. Gadhire, S. K. Bais, Jagdish S. Gejage
Fabtech College of Pharmacy, Sangola, Solapur, Maharashtra, India

Abstract: *Due to their numerous benefits, herbal medications are increasingly attracting people's attention. As treatment options for many disorders, herbal formulations have gained widespread acceptance. Over 80% of the world's population relies on herbal products and medications for a healthy lifestyle, despite the fact that the majority of these uses are unconventional. As the usage of herbal goods has increased, so have the misuse and adulteration of the products, which has disappointed customers and producers and, in some cases, had disastrous results. The creation of reliable analytical techniques that can profile the phytochemical composition with accuracy, including quantitative studies of marker/bioactive chemicals and other important elements, is a significant challenge for scientists. Standardization is a critical essential step in the development ofa quality assurance process, a consistent chemical profile, or simply a constant biological activity for the manufacture and manufacturing of herbal medications. The numerous convectional approaches and more recent advancements are covered in the current review article. Recent developments have been noted in the areas of DNA fingerprinting, metabolomics, differential pulse polarography, chemometrics, X-ray diffraction, etc. Contributions of chromatographic and capillary electrophoresis methods to the standardisation of herbal medicines are also described.*

Keywords: DNA fingerprinting, chromatographic methods, herbal medicines, and standardisation

Objectives

1: Recognize raw materials as sources of herbal medications from cultivation to finished products
2. Be familiar with the WHO and ICH guidelines for the assessment of herbal medications.
3. Be aware with nutraceuticals, natural sweeteners, and herbal cosmetics
4. Value the patenting of natural medicines and GMP.

I. INTRODUCTION

1.1 Introduction of Herbal Technology

The term "herbal" refers to a botanical or plant-based preparation, whereas "medicine" refers to a material that possesses nutritional, therapeutic, or preventative characteristics. As a result, compounds made from plants that have nutritional, curative, or preventative characteristics are referred to as "herbal medicines." As it encompasses all areas of herbal medicine related to botany, medicinal plant research, Pharmacognosy, Phytochemistry, Phytotherapy, botanical medicines, Ayurveda, natural chemistry, agriculture science, Unani medicine, biotechnology, and biochemistry, herbal medicine is an interdisciplinary branch between herbal medicine and Ayurveda. An herbalist is a person who works with plants, particularly medicinal plants. The use of plants to cure sickness is covered in herbal journals.

1.2 Identification, Authentication and Extraction of Herbs

A. Identification of Plant

(a) Expert Determination

Expert determination is the most reliable and accurate technique of identification. In general, professionals have created treatments (monographs, revisions, synopses) of the relevant group, and it is likely that the ideas of taxa used by experts are included in more current floras or manuals. In botanical gardens, herbaria, museums, colleges, universities, etc., experts are frequently found. Although extremely reliable, this approach has drawbacks in that it consumes specialists' valuable time and delays identification.

(b) Recognition

It approaches expert determination in reliability, Based on the identifier's in-depth understand the basic with the questioned plant group, this is said to be the case.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

(c) Comparison

A third way involves comparing an unknown with known specimens, images, descriptions, or pictures. Despite being a great strategy, it could be highly time-consuming or nearly impossible since there aren't enough relevant items to compare.

(d) The Use of Keys and Similar Devices (Outlines and Synopses, etc.)

This approach is by far the most popular since it doesn't need the time, resources, or expertise needed for comparison and identification. Plant identification

1.3 Method of Plant Authentification

A. Macroscopic Method

Shape, size, colour, texture, surface features, fracture characteristics, odour, taste, and other organoleptic traits are used to determine a botanical material's macroscopic identification.

B. Microscopic Method

Botanicals' structural, cellular, and interior tissue characteristics can be ascertained via microscopy. Typically, it is employed to recognise and distinguish between two comparable herbals. This method is widely utilised, easy, fast, and applicable to patented drugs. Star anise (Illiciumverum Hook's) is another example of a plant that may be identified using microscopic methods. Star anise is a fruit with a star shape and an anise flavour; it was once only found in southern China but has now spread to all of the tropics and subtropics of Eastern Asia. In China and India, the fruit is mostly used as an aromatic spice to flavour cuisine and confections. In traditional Chinese medicine, it is renowned for its medicinal efficacy for treating.back pain, hernias, and rheumatism. In Western nations including the United States, an unfortunate rise in newborns experiencing acute neurological symptoms such as seizures, vomiting, and fast eye movement has been linked to star anise herbal tea drinking.

C. Fluorescence Microscope

Specifically, microscopic authentication, also known as cell structure and internal characteristics observation using a microscope and its variants, refers to utilising the microscope to identify herbal medications. In addition to the standard light microscope, polarisation and fluorescence microscopes can also be utilised to improve authentication accuracy. The number of characteristics that may be used for identification increases with the usage of these microscopes.

For example,

It has been shown that starch grains, calcium oxalate crystals, stone cells, capillaries, and fibres all possess stable and unique polariscopic properties. The fluorescence microscope makes the fluorescence released by illuminated herbal tissues visible. Many herbal tissues have the capacity to emit light of a certain wavelength after the absorption of light with a shorter wavelength and greater energy because of their chemical compositions or secondary metabolites 25.

For example,

The fluorescent microscope has been used in recent years to separate the therapeutic plants Oleander diffuse from other species of the same genus that are mistaken for it in herbal markets. The distribution of compounds in the cross section of powdered ASU medicines may be measured using the fluorescence microscope and micro spectrometer.

D. Physicochemical Methods

Total ash, water soluble ash, acid insoluble ash, and sulphated ash are among the parameters. The identification of the particular pharmaceuticals or proprietary medicines can be determined by comparing these values to the normative values of the Indian Pharmacopoeia.

E. Chromatographic Methods

High performance liquid chromatography capillary :

For herbal products, thin layer chromatography and electrophoresis are the most used analytical techniques. Chemical analysis of herbal remedies heavily relies on the study of volatile compounds by gas chromatography.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

1.4 Different Extraction Methods Including Advanced Extraction Techniques Like Supercritical Fluid

Extraction is the process of using a liquid solvent to separate soluble material from an insoluble residue, which can be either a liquid or a solid. Therefore, it is a process for finding a solution that depends on the mass transfer phenomenon. The rate at which the solute diffuses through the liquid boundary layer at the interface typically determines the extraction rate.

The principle methods of extraction are –

- Maceration :This is an extraction method in which a container is filled with finely powdered drug material, such as leaves, stem bark, or root bark. The menstruum is then poured on top, covering the drug material entirely. After that, the container is sealed and preserved for a minimum of three days.
- Percolation :Traditional Chinese medicines are processed using the extraction technique known as percolation. The extraction solvent is continually supplied after the powdered medicinal material is put to the percolation tank, and the percolation extract is concurrently collected. The percolation apparatus is uncomplicated.
- Digestion :When temperature changes do not affect the active components of plant material, digestion is a type of maceration that slightly warms the extract, which results in a more effective utilisation of menstruum.
- Infusion :Infusion is the technique of extracting tastes or chemical compounds from plant material in a solvent like water, oil, or alcohol by letting the material stay suspended in the solvent for an extended period of time (a process often called steeping). The liquid that is produced is also known as an infusion.
- Decoction: In order to extract oils, volatile organic compounds, and other different chemical components, plant material is first dried, then mashed, chopped, or otherwise prepared to allow for maximum solubility. Water may occasionally be substituted with aqueous ethanol or glycerol.

A. Solvent Extraction

A method to separate compounds based on their respective solubilities in two distinct immiscible liquids, often water and an organic solvent, is known as liquid-liquid extraction and partitioning. It is a substance extraction. into another liquid phase from one liquid phase. It is carried out using a separatory funnel in chemical laboratories as a fundamental method. In other terms, this is the preferred dissolution of a material in a suitable solvent in order to separate it from a mixture. Analytically, solvent extraction can be used to concentrate or reject a specific chemical or to separate mixtures. This procedure often distinguishes between soluble and insoluble compounds. In the manufacturing of fine chemicals, mineral processing, and nuclear processing, solvent extraction is employed.

B. Supercritical Fluid Extraction

It is frequently necessary to separate the analyte or analytes from a sample matrix as a first step in the analysis of complicated materials. An analytical separation method should ideally be quick, easy, and affordable; provide quantitative recovery of analytes without loss or degradation; yield an analyte solution that is sufficiently concentrated to allow the final measurement to be made without the need for concentration; and generate little to no waste that needs to be disposed of in a laboratory. For a long time, extraction of bulk samples using hydrocarbon or chlorinated organic solvents was one of the most widely used techniques for carrying out analytical separations on challenging environmental, pharmaceutical, food, and petroleum samples. By means of a Soxhlet extractor.Sadly, liquid extraction typically falls short of a number of the desirable requirements.

Supercritical Fluid

Any material over its critical Point at a temperature and pressure is considered a supercritical fluid. It has the ability to dissolve substances like a liquid and diffuse through solids like a gas. Additionally, a supercritical fluid's various characteristics may be "fine-tuned" near to the critical point since slight changes in temperature or pressure cause large changes in density. In a variety of industrial and laboratory operations, supercritical fluids can replace organic solvents. The most popular Supercritical fluids are carbon dioxide and water, which are utilised for power production and decaffeination, respectively. CO2 is a kind of solvent used for plant extraction. There are no harmful remnants left behind. With small adjustments in temperature and pressure, its extraction properties may be controlled broadly and accurately.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

C. Microwave Assisted Extraction

Supercritical fluids are any substances that are over their critical points at a given temperature and pressure. It may disperse through solids like a gas and dissolve things like a liquid. As a supercritical fluid gets closer to the critical point, its different properties may also be "fine-tuned" since even little variations in temperature or pressure can have a significant impact on density. Supercritical fluids can replace organic solvents in many industrial and laboratory processes. Water and carbon dioxide are the two most often used Supercritical fluids, and they are used to produce electricity and decaffeinate coffee, respectively. In order to extract plant materials, CO2 is a type of solvent. No negative traces are still present. The broad and precise control of its extraction qualities is possible with only little temperature and pressure changes.

D. Ultrasound Assisted Extraction

Since at least the time when fire was discovered, extraction has been employed. Innovative extraction and distillation techniques were developed by the Mayas and Aztecs as well as the Egyptians and Phoenicians, Jews and Arabs, Indians and Chinese, Greeks and Romans, and even Jews and Arabs. Today, extraction procedures including maceration, solvent extraction, steam or hydrodistillation, cold pressing, or squeezing are used on every manufacturing line in the food, pharmaceutical, cosmetic, nutraceutical, and bioenergy sectors. The food and plant-based chemical industries face challenges as a result of rising energy costs and efforts to reduce greenhouse gas emissions. These industries must develop new technologies to save energy, comply with legal requirements for emissions, ensure the safety and control of their products and processes, and reduce costs while improving functionality and quality. As an illustration, current extraction methods face significant technological and scientific challenges. For instance, they frequently need up to 50% of the capital expenditures for a new plant and more than 70% of the total process energy utilised in the food sectors [1]. Due to these flaws, improved extraction methods that can be automated, including ultrasound-assisted extraction, are now being taken into consideration. The primary goals were to minimise organic solvent usage, increase extraction times, and save money and energy. Advances in ultrasound-assisted extraction have been driven by these objectives, leading to a number of cutting-edge methods including ultrasound-assisted Soxhlet extraction, ultrasound-assisted Clevenger distillation, continuous ultrasound-assisted extraction, and ultrasound-assisted extraction in combination with microwave, extrusion, and supercritical fluid extraction**.**

II. ISOLATION AND PURIFICATION TECHNIQUE

2.1 General Isolation Techniques

1. Extraction methods
2. A critical step in the separation of natural plant components and their purification is plant material extraction.
3. Plant matrices naturally include a variety of chemicals with different physical and chemical properties, making them complicated.
4. Properties of chemicals [8]. Therefore, it is essential to thoroughly extract matrices and other components of the plant.
5. Create pure, chemicals that are useful for characterising plants. There are several techniques of extraction.
6. Can be classified [9]. Based on the temperatures they operate in, they have been divided into categories in this chapter.
7. Methods for Low or Room Temperature 9.2.1.1 The cold extraction technique 10) The procedure has been written about in the literature [10, 11]. Specifically, samples of dried plant components (Cut, crushed or milled)

2.2 Chromatographic Technique

A. Introduction

Since ancient times, people on all continents have employed hundreds to thousands of native plants for medicinal purposes. Many plants provide chemicals that are beneficial to maintaining human and animal health. The majority of them are phenols or their oxygen-substituted derivatives, such as tannins, and they include aromatic compounds [1]. Animals in poor health often consume vegetation containing secondary metabolites like tannins and alkaloids. There is

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

a strong argument for animals in the wild using these phytochemicals for self-medication since they frequently include antiviral, antibacterial, antifungal, and anthelminthic activities [2]. The World Health Organization (WHO) estimates that around 80% of people worldwide still utilise herbs and other traditional medicines for their basic medical requirements. Products marketed as pills, capsules, powders, teas, extracts, fresh plants, or dried plants, herbal medicine supplements are nutritional supplements that individuals use to improve their health. Herbs have always been seen as safe, and more and more individuals are consuming them without a prescription.

B. Chromatographic Techniques in Herbal Drug Analysis

The most adaptable separation method is chromatography, which is also widely accessible. Chromatography is defined as a process for separating and identifying specific components or compounds from mixtures of them utilising stationary phase and mobile phase. Utilizing different chromatographic processes, plant materials are separated and purified. A complex system of mixes makes up herbal medicine. As a result, the preferred methods for identifying "botanical drugs" are primarily designed to identify a certain plant by its distinctive fingerprint, which indicates the existence of distinctive chemical components that define that plant's qualities. For the aim of quality control of herbal medicines, it is strongly advised to use chemical fingerprints created using chromatographic techniques, notably hyphenated chromatography, as they may accurately represent the "chemical integrities" of the herbal medicines.Authentication and identification of herbal goods can thus be accomplished using this method. TLC (thin layer chromatography) and HP-TLC (high performance thin layer chromatography) (HPTLC)

2.2.1 Thin Layer Chromatography

Simple term for thin layer chromatography is TLC. It is one of the most widely used and straightforward chromatographic techniques for chemical separation. TLC is often used in the phytochemical assessment of herbal medicines for the following reasons:

1. It allows for quick examination of herbal extracts with no need for sample preparation.
2. It gives information about the resolved substances that is both qualitative and semi-quantitative.
3. It makes it possible to measure chemical components. Additionally, HPLC and GLC fingerprinting are used in

Specific Cases

A high performance TLC (HPTLC) scanner may be used to record data for TLC fingerprinting, including the chromatogram, retardation factor (Rf) values, colour of the separated bands, their absorption spectra, and the maximum and shoulder inflections of all resolved bands. All of them depict the sample's TLC fingerprint profile, along with the profiles on derivatization with various reagents. The data produced in this way may be used to identify genuine pharmaceutical products, weed out adulterants, and preserve the drug's potency and consistency.Before instrumental chromatography techniques like GC and HPLC were developed, TLC was the method of choice for herbal analysis. Since many pharmacopoeias, including the American Herbal Pharmacopoeia (AHP), Chinese drug monographs and analyses, and Pharmacopoeia of the People's Republic of China, still use TLC to provide the first characteristic fingerprints of herbs, it is still frequently used for the analysis of herbal medicines today. Rather, TLC is employed as a less time-consuming means of initial screening together with other semi-quantitative evaluations.

2.2.2 Column Chromatography

In chemistry, column chromatography is a chromatography technique used to separate a single chemical component from a mixture. Molecules flow along the column at varying speeds, allowing them to be divided into fractions, which is how chromatography is able to separate substances based on differential adsorption of compounds to the adsorbent. The method has a broad range of applications since it may be employed with a variety of adsorbents (normal phase, reversed phase, or otherwise) and solvents. Scales from micrograms to kilogrammes can be employed using the method. The fundamental benefit of column chromatography is how inexpensive and easily disposed of the stationary phase is during the procedure.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

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

solvent through the column.The latter stops recycling-induced stationary phase deterioration and cross-contamination. Both gravity and compressed gas can be used in column chromatography to force the solvent through the column.

2.2.3 High Performance Thin Layer Chromatography (HPTLC)

The pharmaceutical sector uses the HPTLC technique often for process development, adulterant detection in herbal products, pesticide content determination, mycotoxin determination, and quality control of medicinal plants and foods. A lesser amount of mobile phase than in HPLC can be used to run many samples concurrently, according to well-reported findings. Additionally, mobile phases with a pH of 8 or higher may be employed for HPTLC.The repeated detection (scanning) of the chromatogram under the same or different circumstances is another benefit of HPTLC. In order to simultaneously test many components in a multicomponent formulation, HPTLC has been researched. This method allows for the verification of diverse plant species as well as the assessment of the uniformity and stability of their preparations from various manufacturers. For phytoconstituents like Bergenin, catechine, and gallic acid in Bergeniacilliata and Bergenialingulata found in crude pharmaceuticals or herbal preparations, many researchers have developed an HPTLC approach.

Example of Mobile Phase Used in HPTLC for Herbal Compound

The examination of herbal remedies has seen the most extensive use of HPLC in recent years. The most common columns employed in the analytical separation of herbal medicines are likely reversed phase (RP) columns. For isolating and purifying herbal components, pharmaceutical companies frequently utilise preparative and analytical HPLC. Preparative HPLC may be divided into two categories: low pressure HPLC (usually under 5 bar) and high pressure HPLC (pressure more than 20 bar). In analytical HPLC, the crucial factors to be taken into account are resolution, sensitivity, and quick analysis times, whereas in preparative HPLC, the crucial factors to be taken into account are throughput or recovery, as well as the level of solute purity and the amount of compound that can be produced per unit time.Larger stainless steel columns and packing materials (particle size 1030 m) are required for preparative HPLC (pressure >20 bar). Examples of silica columns in normal phase include Kromasil 10 m, Kromasil 16 m, and Chiralcel AS 20 m, while those in reverse phase include Chromasil C18, Chromasil C8, and YMC C18. Compounds are to be isolated or purified, but in analytical work, information about the sample is what is sought after. This is crucial in the modern pharmaceutical sector because new products—natural and synthetic—must be released onto the market as soon as feasible. Being able to use such an effective purification method reduces the amount of time needed for the synthesis conditions.

2.2.4 High Performance Liquid Chromatography (HPLC)

The distribution of the analyte (sample) between a mobile phase (eluent) and a stationary phase is the foundation of the HPLC separation principle (packing material of the column). The molecules travel through the stationary phase more slowly depending on the chemical makeup of the analyte. The duration of a sample's "on-column" time is determined by the unique intermolecular interactions between the sample's molecules and the packing material. As a result, different components of a sample elute at various periods. Thus, the sample components are successfully separated. After exiting the column, the analytes are recognised by a detecting equipment (such a UV detector). A data management system (computer software) converts and records the signals, which are subsequently shown in a chromatogram.The mobile phase may be subjected to further detector units after passing the detector unit, a fraction collecting unit, or the trash after passing the detector unit. The following components are typically found in an HPLC system: a solvent reservoir, a pump, an injection valve, a column, a detection unit, and a data processing unit. The pump circulates the solvent (eluent) throughout the system at a constant high pressure. A steady and pulseless flow from the pump is necessary to maintain the minimum amount of drift and noise in the detector signal. The injection valve gives the eluent access to the analyte.

2.3 Purification Techniques for Isolated Phytoconstituents

The process of isolating the components of plant extracts or useful sections one at a time and purifying them into monomer compounds using physical and chemical processes is known as the separation of phytochemicals. Current

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

isolation techniques still often include solvent extraction, precipitation, crystallisation, fractional distillation, salting out, and dialysis. The separation of phytochemicals, however, also benefits from the use of contemporary separation techniques such high performance liquid chromatography, ultrafiltration, and high performance liquid drop countercurrent chromatography. The common techniques and their unique uses for isolating phytochemicals are described in this section.

2.4 Solvent Method

A. Acid and Basic Solvent Method

The process is carried out in accordance with the varying acidity and alkalinity of each ingredient in the combination. Alkaline organic substances that are insoluble in water, such as alkaloids, may react with inorganic acids to generate salts that may be used to separate them from nonalkaline and water-soluble substances. Bases can salt and dissolve in water acid components with carboxyl or phenolic hydroxyl groups. It is possible to separate components containing lactone or lactam substructures from other water-insoluble components by saponifying and dissolving them in water. In order to separate the entire extract into acidic, alkaline, and neutral components, the complete extract can be dissolved in lipophilic organic solvents (ethyl acetate is frequently used for this) .Of course, after correcting the pH, the entire extract can also be dissolved in water and extracted with organic solvents. The fractions can be further separated by using a pH gradient extraction due to differences in the alkalinity or acidity of the fractions.

It is important to pay attention to the strength of the acidity or alkalinity, the contact time with the separated components, the heating temperature, and the time when using the acid and basic solvent method in order to prevent structural changes of some compounds under harsh conditions or the inability of the chemical structures to be returned to their original states.

B. Polarity Gradient Extraction Method

Using this technique, the separation goal is accomplished based on the various polarities of the various plant extract constituents and the various partition coefficients in two-phase solvents. The polarity of the components in plant extracts is typically taken into account when choosing between different two-phase solvent systems. For instance, n-butanol and water may be used to separate components with strong polarity, ethyl acetate and water can be used to separate components with medium polarity, and chloroform (or ether) and water can be used to separate components with weak polarity. The plant extract must first be dissolved in water before the extraction process can begin. The solution or suspension is then extracted in a separating funnel using a separate organic solvent that is not miscible with water due to polarity differences.As illustrated in Figure 1, the extract was typically extracted using petroleum ether (or cyclohexane) first, followed by ethyl acetate (or chloroform), and then water-saturated n-butanol. Low polarity, lipid-soluble molecules can be found in the petroleum ether layer. Medium polar substances including monoglycosides , flavonoids, and substances with more polar functional groups are present in the ethyl acetate layer. Strongly polar substances, such as oligoglycosides and other water-soluble elements, are present in the n-butanol layer. The greatest polarity is seen in chemicals in the water layer, including glycosides with more glycosyl groups, carbohydrates, amino acids, proteins, and other water-soluble substances.

C. Precipitation Method

It is a technique that relies on the creation of certain phytochemicals as precipitates through reactions with particular reagents, or the precipitation of some components from solutions with the addition of particular reagents, which can lessen the solubility of some components in solutions. If the target components are necessary for the formation of precipitation, the precipitation process must be reversible. The precipitation reaction can be irreversible if the components are nontarget since they will cause the precipitation to be eliminated. The following categories might be applied to this approach depending on the addition of chemicals or solvents: A particular solvent that is mutually soluble with the solution can be used to modify the constituents in the mixed component solution, allowing them to precipitate out of the solution.Fractional precipitation is the progressive precipitation caused by varying the polarity or quantity of solvent supplied. For instance, ethanol is added to the water extracting concentrate to increase its alcohol content to more than 80%, which causes polysaccharides, proteins, starch, gum, and other substances to precipitate and

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

be removed after filtration when using water as an extracting solvent to extract phytochemicals. The previous process is known as ethanol precipitation and water extraction. Using this technique, crude polysaccharides from plants are frequently separated.

III. METHODS FOR STANDARDIZATION OF HERBAL DRUGS

3.1 Importance of Standardization

A. Standardization of Herbal Formulation

Application of Good Manufacturing Practices is required for standardising herbal formulation (GMP). Additionally, it is deemed crucial to research a variety of parameters, including pharmacodynamics, pharmacokinetics, dose, stability, self-life, toxicity evaluation, and chemical profiling of herbal formulations. Aflatoxine level, heavy metal contamination, and Good Agricultural Practices (GAP) in herbal medication standardisation are a few more aspects that are equally important.

B. Standardization of Polyherbal Formulation

As polyherbal formulations combine more than one herb to achieve the desired therapeutic effect, standardisation is crucial for maintaining and evaluating the product's quality and safety. Standardization reduces batch-to-batch variation and guarantees the polyherbal formulations' acceptability, safety, efficacy, and quality. The standardisation of several commercially available herbal and polyherbalMadhumehariChurna (Baidynath) formulations, which comprise a blend of eight herbs. A traditional remedy called dashamularishta is used to restore physiological processes to normality following childbirth. The identity, purity, and potency of the polyherbal formulation, as well as setting criteria for this Ayurvedic formulation, were determined using TLC and HPTLC fingerprint profiles.

C. Standardization and Quality Control of Herbal Crude Drugs – Parameters

Standardization and quality control of herbals, according to WHO (1996a and b, 1992), 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. Normal attention is given to quality indicators such

Morphology and Organoleptic Evaluation

Morphological characteristics are crucial for discriminating in the case of entire drugs. It usually consists of things like colour, smell, taste, form, and size. Details like as fractures, texture, and venation are included.

Microscopic and Histologic Evaluation

These are beneficial in both whole and powdered form. It focuses mostly on the examination of traits including trichomes, calcium oxalate crystals, vascular bundle patterns, stomata, fibres, and parenchyma.

Qunatitative Microscopic Study

Microscopic measurements such as fibre size, palisade ratio, stomatal index, stomatal number, and vein termination number. Such research aids in separating closely related species.

Physical Evaluation

Physicochemical parameters such as moisture content, solubility, viscosity, refractive index, melting point, optical rotation, ash values, extractives, and foreign organic matter are studied. fibre size and palisade ratio Such research aids in separating closely related species.

Qualitative Chemical Evaluation

This includes identifying and classifying crude drugs according to their phytochemical components. It uses several analytical methods to find and isolate the active ingredients. Identification of the botanical components, extraction with the appropriate solvents, purification, and characterisation of the active components of medicinal value are all steps in phytochemical screening approaches.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

Quantitative Chemical Evaluation

to calculate the volume of the main component classes. Toxicological studies: These serve to identify pesticide residues, possibly hazardous substances, safety tests in animals such the LD50, and microbial assays to assess whether potentially dangerous bacteria are present or absent.

Microbiological Parameters

It contains the entire amount of viable, the entire mould count, and the entire coliforms count. Limiters can be used as a quantitative or semiquantitative instrument to measure and manage the level of impurities, such as solvents, contaminants sent straight from the manufacturer, and reagents used in the extraction of various herbs.

3.2 Convectional Method

This section deals with the identification and categorization of crude drugs in terms of their phytochemical components. In order to find and isolate the active ingredients, it uses several analytical techniques. The identification of plants, their extraction using the right solvents, purification, and characterization of the pharmaceutically significant active ingredients are all steps in the phytochemical screening process.

Quantitative Chemical Evaluation

to calculate the amounts of the main component classes.

Toxicological Studies

This aids in establishing pesticide residue levels, potentially poisonous substances, safety tests on animals such the LD50, and microbial assays to establish the presence or absence of potentially harmful microorganisms.

Microbiological Parameters

It covers the entire viable content as well as the complete mould and coliform counts. Limiters are a quantitative or semi-quantitative instrument that may be used to measure and limit the amount of impurities, such as solvents, reagents used in the extraction of different herbs, and contaminants that are sent directly from the production process.

3.3 Problem of Advance Herbal Technology

Although herbal medicine has a very strong history of traditional applications and a worldwide restructuring, there are still many obstacles to its promotion, particularly in wealthy countries. The following issues must be resolved before traditional herbal knowledge is promoted globally.

- **Quality Issues:** The primary issues that diminish the efficacy of herbal preparations and can be regarded as important variables impacting the quality and purity of herbal medicines include adulteration, misidentification of plants, poor collecting and preparation, and inappropriate formulation processes.
- **Processing And Harvesting Issues:** Inadequate pre and post harvest processes, indiscriminate harvesting, poor agricultural and propagation methods, and a lack of processing skills all contribute to the inferior quality of herbal medications.
- **Quality Control Related Issues:** The biggest obstacles to maintaining the quality of herbal pharmaceuticals include standardisation, inadequate quality control practises, and a lack of Good Manufacturing Practices (GMP). In small and medium-sized companies, it is also common for farmers and manufacturers to be unaware of the guideline, and for the guideline to not be implemented or regulated.
- **Administrative Issues:** Lack of effective monitoring and regulating, as well as a lack of regulatory and governing power in the herbal sector, are necessary need for the quality of medicines. Infrastructure-related problem: The main issues are a lack of processing skills, skilled workers, advanced equipment, the use of contemporary procedures, and local instrument fabrication facilities.
- **Pharmacogivilane:** To identify the toxicological information and adverse drug reactions of herbal pharmaceuticals, proper pharmacogivilane in the herbal sector is necessary. It's important to thoroughly

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

monitor adverse responses, contraindications, combinations with other medications, foods, and traditional drugs.

- **Clinical Trial:** Clinical trials are required to establish the safety and efficacy of these treatments before introducing them in the worldwide market because safety is still a major concern when using herbal remedies.
- **IPR And Biopiracy:** Because safety is still a big worry when utilising herbal medicines, clinical trials are necessary to demonstrate the safety and efficacy of these therapies before putting them into the global market.
- **Irrational Use:** Unfortunately, contrary to popular belief, herbal products do have negative effects and interactions. Therefore, the inappropriate use of these pharmaceuticals can result in a number of issues that could impede their promotion.
- **R&D:** The primary necessity for any drug is research and development on dose, processing, and procedures, although compared to allopathic medicine, it is far less in the herbal business. Nevertheless, the tendency has changed in recent years. Research is required to comprehend the mechanism of action and pharmacokinetics phenomena, as well as to improve/create monographs and reference standards for marker-based analysis. Another issue for a sustainable, socio-culturally equitable, and safe supply of herbal medicines is the significant gap between current ethnopharmacological and contemporary medicinal plant research.
- **Other issues:** Unreliable and inaccurate information, a lack of competent doctors, a lack of funding, a lack of targeted marketing and branding, and a lack of knowledge exchange are further factors impeding the global promotion of herbal medicine. Another significant issue is the lack of protection for biodiversity and traditional medicinal plants.

IV. SELECTION CRITERIA FOR SUBSTANCES OF HERBAL ORIGIN ,RELEVANT FOR STANDARDIZATION AND QUALITY CONTROL OF HERBAL MEDICINES

General Considerations In The Standardization And Quality Control Of Herbal Materials, Herbal Preparations and Herbal Medicines

Herbal ingredients, herbal concoctions, and herbal products in their completed forms are highly complicated. This can make it exceedingly difficult to identify and quantify herbal medications and make it very difficult to detect adulteration. It should be made clear that utilising markers to identify herbal medicines and measuring the amount of marker compounds present in herbal medicines do not, by themselves, ensure the quality of herbal medicines.Good agriculture and collecting procedures (GACP) and good manufacturing practises (GMP) (such as those mentioned in references 1 and 4), when necessary, must be used in conjunction with quality control to cover all stages of production. the selection of reference materials and the control of quality criteria It is important to consider that different constituents in herbal medicines may have varying degrees of effect on their ultimate quality, safety, and efficacy. Because of this, the principles listed below should be followed while choosing the chemicals for identification and quantification. If components have been found to have recognised therapeutic action (activities), they should be employed as markers.

If situation number one is not true but known constituents with established pharmacological action (activities) should be employed as markers. If the aforementioned scenarios don't apply, the production process and analysis of marker substance(s) including additional distinguishing constituents can be used to determine the identity and amount of herbal materials, preparations, and medications (s). Note that utilising the appropriate reference sources and descriptions, microscopic, macroscopic, or DNA analytical techniques may be used to identify herbal ingredients, as well as, to a lesser extent, herbal preparations and completed herbal products.

4.1 Drugs for Advance Technology

A. Jasmine (Jasminum)

The limbic system, which is in charge of affecting the neurological system, sends signals to your body when you inhale jasmine molecules. Jasmine may be kept as a plant in your room to help with anxiety and sadness, or you can use it as an essential oil in a diffuser to get the aroma. Jasmine not only relieves anxiety and despair but also helps with attention, sleep, hormone balance, and infection prevention. This demonstrates the versatility of the jasmine plant and how it may raise your standard of living.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

B. Shankpushpi (Convolvulus Pluricaulis)

Shankhpushpi, also known as Shankhini, Kambumalini, Samkhapushpi, Sadaphuli, and Sankhaphuli in common parlance, is a strong memory enhancer and brain tonic that actively works to increase intellect and brain function. Due to its shankh or conch-shaped blossoms, the plant was given the name shankhpushpi. Additionally, it aids in improving focus, learning potential, mental tiredness, sleeplessness, stress, anxiety, sadness, etc. Because it has antidepressant properties, it enhances mental wellness and could aid in treating depression. Ayurveda claims that Shankhpushpi may ease anxiety and tension while also calming the brain. Due to its Medhya (improves intelligence) virtue, it also enhances memory by serving as a brain tonic.

V. CONCLUSION

Since the beginning of human history, people have utilised plants, herbs, and ethnobotanicals to treat illnesses and promote health. Modern medicine today is based on plants and other natural resources, and commercial medication formulations are mostly made of these sources. In the globe, plants constitute the source of around 25% of medicines that are prescribed. In spite of this, plants are frequently employed in medicine rather than pharmaceuticals. Some people prefer to use herbal medicine as a kind of therapy. Some people supplement conventional medications with herbal remedies. The only system of healthcare that is accessible or inexpensive in many underdeveloped nations, however, is traditional medicine, of which herbal medicine is a vital component.Whatever the motivation, those who use herbal remedies should be sure the items they purchase are secure and contain what they claim to, whether this is a specific herb or a specified quantity of a certain herbal component. Science-based information on dose, contraindications, and efficacy should also be provided to consumers. Global legal harmonisation is required to do this in order to direct the ethical production and distribution of herbal medicines. Such law should permit this to be done if there is adequate scientific evidence of a herb's benefits.

REFERENCES

[1]. Text book of Pharmacognosy(Niraliprakashan) page no 48-49
[2]. Text book of Pharmacognosy (K.D. TRIPATI) page no 28-52
[3]. Zhang DK, Han X, Li RY, Niu M, Dong Q, Yang M, Wang JB, Xiao XH. Investigation of the chemical markers for experiential quality evaluation of crude aconite by UHPLC-Q-TOF–MS. J Sep Sci. Page no. 104
[4]. Sim CO, HamdanMR,Ismail Z and Ahmad MN, Assessment of Herbal Medicines by Chemometrics – Assisted Interpretation of FTIR Spectra, Journal Of AnalyticaChimica Act, 2004 page no. 412-450
[5]. Bhutani KK, Finger-Printing of Ayurvedic Drugs, The Eastern Pharmacist, 2000; page no 507
[6]. R. Upton, International Symposium on Quality of Traditional Chinese Medicine with Chromatographic Fingerprint, Guangzhou, 2001 page no. 510
[7]. Ray A, Gulati K. Recent advances in herbal drug research And therapy. I K International. Page no. 112-153
[8]. Agarwal SS, Paridhavi M. Herbal drug technology Universities Press India Pvt Ltd page no 809
[9]. Zafar R, Panwar R, SagarBhanu PS. Herbal drug Standardization: The Indian Pharmacist page no 2078

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 2, January 2023
Impact Factor: 7.301

[10]. Indian Herbal Pharmacopoeia, Indian Drug Manufacturers' Association, Mumbai, 2002. Page no. 124
[11]. British Herbal Pharmacopoeia, British Herbal Medicine Association, 1996. Page no 448
[12]. Quality Control Methods for Medicinal Plant Materials, WHO, Geneva, 1996 page no 505
[13]. Bhutani KK. Herbal medicines enigma and a challenge for Science and guidelines for new initiatives. J Nat Prod 2003 page no 412
[14]. Meena R, Meena AK, Khan SA, Mageswari S. Standardization of Unanipolyherbal drug – Jawarish-e-Darchini. J Pharm Res 2010 page no 908
[15]. Pattanaya P, Jena RK, Panda SK. HPTLC fingerprinting in The standardization of sulaharan yoga: An ayurvedic tablet Formulation. Int J Pharm Sci Rev Res 2010 page no 709
[16]. Kalpana J, Preeti C, Dnyaneshwar W, Bhushan P. Molecular Markers in herbal drug technology. Cur Sci 2004 page no 123
[17]. Pharmacovigilance of herbal medicines: Current state and Future directions: London, UK, 26-28 April, 2006. Drug Safety: 2006 page no 516
[18]. Soni K, Naved T. HPTLC- Its applications in herbal drug Industry. The Pharma Review 2010 page no 69