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REVIEW ON ADVANCE HERBAL TECHNOLOGY AS PER WHO GUIDELINES

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ABSTRACT
Objective:-Learn first how to apply various techniques in different ways.
Method:-Microwave extraction, Soxhlet extraction, Digestion, Infusion, and Maceration
Exist Due to the many advantages of plants, there is a growing inclination among individuals to use them. It is now accepted that the use of plants is used in the treatment of many diseases. Despite some negative uses, the truth is that over 80% of the world's population relies on herbal and medicinal products to maintain their health. The escalated utilisation of plants has also resulted in several instances of mistreatment and contamination, resulting in discontentment among consumers and producers, and in some circumstances, fatalities. A significant obstacle that scientists must overcome is the development of verified analytical techniques capable of determining the chemical makeup of phytochemicals. The approach should include thorough investigation of prescription medications/bioactive pharmaceuticals and other crucial variables. Design is essential for the development of effective services related to biological activity patterns, chemical profiles, and even the design and manufacturing of plants. This review article provides an overview of both conventional procedures and contemporary advancements.[1]
Result:-Medications made from herbs have the power to improve overall health and boost immunity while reducing negative effects, able to actually save the money.
Conclusion:-Based on this analysis, we can infer that medicinal herbs are significant in our daily existence. The use of herbs to treat mild to moderate pain is common because they have no negative side effects.
Key word: Herbal medicine, Authentication, Extraction, Purification, Chromatographic technique,

INTRODUCTION:

The fundamental ideas of herbal technology, which is applied globally, are covered in this article. Herbal medications: With the exception of allopathy, herbal medicines make up the majority of all legally recognised medical systems in India, including Ayurveda, Yoga, Unani, Siddha, Homoeopathy, and Naturopathy. Millions of Indians commonly utilise over-the-counter (OTC) herbal prescription medications for non-allopathic systems. They also frequently employ herbal spices, home treatments, and health foods. The market for herbal medications has grown rapidly in the past several years, and due to their natural source and low side effects, These drugs are becoming increasingly popular in both developed and developing countries. Herbs are the result of centuries of healing by generations of traditional healers. Nutraceuticals are food products used for nutritional or medical purposes and marketed in industrialized countries. However, the global demand for alternative medicine has led to the increase of natural products and the legitimization of the current medical system. The use of herbal medication technology involves the conversion of botanical resources into medicinal products. It is necessary to ensure quality control and standardisation, as well as the proper incorporation of traditional knowledge and contemporary scientific methods. [2]

AUTHENTICATION OF PLANT:

Authentication of Herbal Drugs:

A quality control procedure known as "herbal authentication" makes sure that the right plant species and parts are utilized as raw materials in herbal products.[3]

To begin the development of a botanical product, the first stage is to acquire genuine raw materials. Moreover, every phase of the harvest, storage, processing, and formulation processes may have a

substantial influence on the ultimate quality and uniformity of the end product. Therefore, it is essential to use techniques that guarantee quality control in both the production and storage processes in order to maintain the effectiveness and safety of these items. Moreover, these controls are essential for assessing the pharmacological, toxicological, or clinical research of botanical products.

1) Using taxonomic data:

To identify and authenticate botanical materials, the first stage is use conventional botanical techniques to gather and record the plant at its original location. This procedure is used to ascertain the drug's botanical origin and establish its scientific Latin binomial name, which consists of the genus and species. This is the first stage of the authentication procedure. Prior to authenticity, it is necessary to provide information such as the botanical name, vernacular names, collection place of the plant material, characteristics of the collector, habitat, collecting season, altitude, and the specific section gathered.

2) Sample voucher for the herbarium:

For future use, sample that was gathered ought to be preserved as a voucher sample in a research facility or herbarium.

3) Approach at the macroscopic level:

Macroscopic analysis of plant material involves comparison of various methods with reference materials, including shape, size, color, texture, surface properties, refractive properties, smell, taste and other sensations

4) Approach at the microscopic level:

Microscopy is used to determine the structural, cellular, and interior tissue features of botanicals. Usually, it is used to differentiate between two botanicals that are similar. It is a frequently used method, fast, easy and suitable for special medications. Star anise, scientifically known as star anise, can be distinguished using microscopic techniques. Star anise is a fruit with a star-like shape and a taste reminiscent of fennel. It was originally in southern China and later spread to other tropical and subtropical parts of East Asia. ..In China and India, this fruit is used only as a spice to enhance the taste of food and desserts. Traditional Chinese medicine is renowned for its efficacy in treating hernias, rheumatism, and back pain.Unfortunately, the United States and other western nations are reporting an alarmingly high number of infant cases with acute neurological effects, including vomiting, seizures, and rapid eye movement.

5) Physicochemical Method

Parameters include total ash, sulfated ash, water-soluble ash, and acid-insoluble ash. The identity of a single drug or potential drug can be determined by comparing its values with appropriate standards in the Indian Pharmacopoeia. [4]

Material and Methods

Extraction:

Extraction of medicinal plants involves the separation of active plant compounds, such as alkaloids, flavonoids, terpenes, saponins, steroids and glycosides, from inert or inactive materials using appropriate solvents and methods.

Different methods of extraction:

1) Infusion
2) Digestion
3) Decoction
4) Percolation
5) Soxhlet extraction
6) Microwave assisted extraction
7) Ultrasound assisted extraction

1) Maceration

When making a maceration (for a fluid extract), whole or finely ground plant material is placed in a stoppered container with the solvent and stirred frequently for a predetermined amount of time, or until the soluble material dissolves. When it comes to thermolabile medications, this approach works best.

2) Decoction

This process involves boiling the crude medicine in water for 15 minutes, cooling it, straining it, and then running enough cold water through it to achieve the desired volume. This extracts the heat- and water-soluble constituents from the crude drug.

3) Infusion

The easily soluble components of the crude medications are mixed in a diluted form. To make new infusions, the solids are macerated for a short while in either boiling or cold water.

4) Digestion

Here the process of extraction is carried out in presence of light amount of temperature. It is applied when the menstrual cycle's solvent efficiency is enhanced and a slightly elevated temperature is not uncomfortable.

5) Percolation

This approach is the most often used for acquiring active components for tinctures and fluid extracts. A percolator is often referred to as a thin, cone-shaped jar having apertures on both ends. The allocated menstruum is used in the proper amount to moisten the solid materials. These ingredients are then put in a container that is firmly sealed and let to stand for about four hours. Subsequently, the mass is tightly packed and the lid of the percolator is closed. After increasing the amount of solvent to form a thin layer above the solid substance, the combination is then placed in a sealed percolator for a duration of 24 hours to undergo maceration. The liquid inside the percolator is thereafter let to slowly trickle once the outlet is opened. Additional menstruum is included as necessary until the percolate reaches about 75% of the desired final volume. Subsequently, the liquid that has been expressed is introduced into the percolate following the pressing of the marc. The appropriate volume is achieved by adding an adequate quantity of menstruum, and the resulting liquid is either filtered or let to settle before being poured out.

6) Sonication

During the process, ultrasound at frequencies between 20 and 2000 kHz increases the permeability of the cell wall, causing cavitation. The method's broader use is limited by its higher costs, despite its effectiveness in some scenarios, such as the extraction of rauwolfia roots. One negative of the technique is the infrequent but well-known adverse influence of ultrasonic energy (higher than 20 kHz) on the active elements of medicinal plants. This impact results in the creation of free radicals and undesirable modifications in the drug molecules [6].

7) Supercritical fluid extraction:

Since the late 19th century, various chemical constituents have been extracted using supercritical fluid technology. Typically, CO2 is used as the mobile phase, and pressure is applied throughout the chromatographic flow path. When a fluid is above its critical temperature (Tc-critical temperature) and critical pressure (Pc-critical pressure), it is referred to as supercritical. The supercritical region of the phase diagram is the phase area that lies beyond the critical point, which is situated at the right upper end. It is impossible to liquefy a gas by applying more pressure above the Tc. Put another way, a supercritical fluid technology is neither but can act like a liquid or a gas. Viscosity, diffusivity, and density are the defining characteristics of a supercritical fluid. The regions that correspond to the gas, liquid, and solid states are defined by the curve. The end of the vapor-liquid coexistence curve is designated by the critical point. No phase transition occurs above the critical temperature because the fluid, under any pressure, is unable to change from the gas phase to the liquid phase. There is only one phase in the supercritical environment, which is referred to as such because it has properties that are halfway between those of a pure liquid and a gas.[7]

8) Microwave-assisted extraction:

One of the more sophisticated extraction techniques used to prepare medicinal plants is this one. The method makes use of the dipole rotation mechanism and ionic transfer, which involves moving the charged ions found in the drug material and solvent. These systems are excellent for the extraction of flavonoids. In this process, electromagnetic radiation with frequencies of 300 MHz and 300 GHz and wavelengths of 1 cm and 1 m is used. Microwaves with a frequency of 2450 Hz produce power in the range of 600 to 700 W. In this technology, the object is bombarded with microwave energy and the object absorbs electromagnetic energy and turns into heat. Therefore, the heat generated facilitates the penetration of the solvent into the matrix. Polar solvents facilitate the extraction process by increasing solvent penetration, causing dipole rotation and ion migration. Nonpolar solvents are not

recommended for use in this method because the microwave radiation they release will only produce a small amount of heat when they are used.

Advantage:

There are unique benefits to using a microwave to aid in extraction, including reduced solvent use, shorter extraction times, and improved results.

Disadvantage: Only phenolic compounds and flavonoids can be processed using this method. Because of the high temperature involved,compounds like astannins and anthocyanins may be degraded[5].

Ultrasound-assisted extraction :

To achieve this, to increase to increase to increase to increase to increase to increase to increase to increase to increase to increase to increase therefore secondary metabolites will be released. It is necessary to wait for the plant to dry before grinding it into fine powder and sifting it properly. Once prepared, the sample is mixed with a suitable extraction solvent and placed in the ultrasonic extractor. Sound energy makes the extraction process require less heat.

Advantages:

Small samples can benefit from ultrasound-assisted extraction, thus increasing efficiency while reducing extraction time and labor intensity.

Disadvantages:

Replicating this method is challenging, and applying a lot of energy could cause free radicals to be produced, which would degrade the phytochemical.[7]

Solid phase extraction :

A sample preparation technique called solid phase extraction is used to separate, enrich, and purify different components from aqueous solutions based on their chemical and physical characteristics. This is bringing aqueous samples into contact with a solid phase, also known as a sorbent, so that the compound can be adsorbed on the solid phase's surface before being eluted. The amount of extract in the sample is insignificant when compared to the amount of analyse. Analytical laboratories frequently employ solid phase extraction.. Furthermore, it addresses problems with the liquid-liquid extraction process, including inadequate phase separation, low recovery, and excessive organic solvent waste. In liquid-liquid extraction, the glassware required is also pricey. Sorbent: A substance that is used to absorb or adsorb various liquids. diverse packing types used in solid phase extraction Particle size determines the packing used in solid phase extraction.

Selection of Solvent:

Solvant	**Misible in water**
Hexane	No
Carban tetrachloride	No
Ethyl acetate	Poorly
Acetone	Yes
Methanol	Yes
Acetic acid	Yes

Table 2. Commonly used Solvents in Solid Phase Extraction

ISOLATION AND PURIFICATION OF TECHNIQUES

General isolation technique:

1) Chromatographic techniques
2) Spectroscopic techniques

It is used to determine the properties of individual products. Drug development targeting new mechanisms of human diseases begins with the identification and isolation of bioactive compounds from plants. [9] The composition of the extract made using the above process is a mixture of different types of natural products with different polarities. Further filtration and isolation are required to produce pure bioactive compounds. Methods for identification and characterization of pure bioactive natural products are also affected by their isolation In recent years, new advances have been made in purifying and isolating natural products. Various separation methods, especially different types of chromatography, are used to separate and purify a large number of biologically active natural products. The column chromatography and TLC are are well known for their economy and convenience.[10]

Chromatographic techniques:

Chromatography is a widely used and versatile separation technique. Chromatography is a technique that uses stationary and mobile phases to separate and identify compounds, compounds, or mixtures thereof. Plant materials are separated and refined using different chromatographic techniques. Herbs have various techniques. The main goal of the popular method of identifying "plant medicines" is to identify the unique fingerprints of plants that indicate the unique quality of biological substances. For the purpose of quality control of herbal medicine, it is recommended to take fingerprints from the chromatography technique,especially the hyphenated chromatography technique. This is because they can reasonably represent the "integrity" of the plant and can therefore be used to authenticate and identify herbal products.[11]

Herbal drugs chromatographic techniques -

- Thin layer chromatography (TLC)
- High performance liquid chromatography (HPLC)
- Ultra-high performance liquid chromatography (UHPLC)
- Hydrophilic interaction chromatography (HILIC)
- Gas chromatography (GC)
- Two-dimensional (2D) chromatography.[12]

Thin-layer chromatography:

Principle:

The principle of TLC involves the separation of compounds based on their differential migration through a thin layer of adsorbent material. Like other chromatographic techniques, thin layer chromatography is based on the concept of separation. Separation depends on the relationship between the two chemical phases. The drug in the mobile phase moves towards the surface of the station. Following this model, compounds with higher affinity for steady-state time show slower degradation rates compared to other compounds. Consequently, the combination has been divided. Once the separation process is complete, the component portions of the mixture appear as dots on the plates at their respective levels. Accurate detection procedures ascertain the essence and attributes of the subject.

Components of Thin Layer Chromatography (TLC):

TLC plates:

Works best when prefabricated and on a fixed level: These slabs are stable and chemically stable, their entire surface is covered with a thin layer of stable surface. The stationary phase of the plate has good thickness properties.

TLC chamber:

Suitable for the production of TLC cards. The room is always maintained for the health of the place. It also prevents dust from entering the process and stops the solvent from evaporating.

Mobile phase:

This includes solvents or combinations of solvents. For some TLC to occur, time spent on the mobile phone needs to be pure and free of objects. The recommended solvents and standards (stationary phases) are weak chemicals.

A filter paper:
Moisten while mobile to place in the chamber.As a result, a mobile phase's rise is uniform throughout the stationary phases.

Applications of TLC:
1. Many industries and research fields use TLC extensively.
2. Pharmaceutical formula quality assurance and testing
3. Examination of food for antibiotics and drug residues.

Column chromatography:
Chromotherapy in Line Proteins vary in size, shape, net charge, steady-state density and binding capacity. Chromatographic techniques can be used to purify any of these properties. The most commonly used of these techniques is column chromatography. Biomolecules can be purified by this method. The samples to be separated are first loaded into the chromatography column (stationary phase) and then through the washing machine (mobile phase) (Figure 1). Note that they will pass through the fiberglass-reinforced interior material. The sample is collected at the bottom of the device depending on volume and time.

HPTLC:
The pharma industries use this technique widely for development of processes, detection of adulterant, percentage of pesticide identification, identification of mycotoxin, and QC of herbs and health foods. As opposed to HPLC, it has been widely reported that multiple samples can be run concurrently with less mobile phase. It is also reported that HPTLC can also use mobile phases with pH 8 or higher. Another advantage of HPTLC is that chromatograms can be detected (scanned) many times under the same or different conditions. Therefore, research on the simultaneous determination of various products in various formulations has focused on HPTLC. This method allows the identification of different plants and the evaluation of the consistency and stability of preparations prepared by different companies. Some workers have developed the HPTLC method for phytoconstituents such as gallic acid and catechins in Bergenaciliate and Bergenaligulate, as well as phytoconstituents in crude drugs.

Chemical compounds (Herbal):

Chemical compound(Herbal)	Mobile Phase
Lipophilic compound,EssentialOil,Terpenes,Coumarin	Toluene:Ethyl Acetate[93:7]
Alkaloid	Toluene:EthylAcetate:Dimethylamine amine[70:20:10]
Flavonoids	Ethyle Acetate :Formic acid :Glacial Acetic Acid: Water[100:11:11:26]

Table 3: Typical HPTLC mobile phase for plant chemicals

High Performance Liquid Chromatography (HPLC):
The most widespread use of HPLC in the examination of herbal remedies has occurred in recent decades. It's possible that reversed phase (RP) columns are the most often utilised in the analytical separation of herbal remedies. In the pharmaceutical industry, preparative and analytical HPLC are frequently used to isolate and purify herbal compounds.

There are two types of HPLC preparation:
1) Low pressure HPLC (usually less than 5 bar)
2) High pressure HPLC (pressure > 20 bar).

In the preparation of HPLC, the amount of compounds that can be produced in one go or pass and the purity of the solvent are important considerations. In HPLC analysis, these factors include resolution, sensitivity, and measurement speed. Preparation of HPLC (pressure > 20 bar) requires larger particles and larger stainless steel column with particle size of 1030 µm. Bromanil 10 µm, kormas 16 µm and

Choralcelo AS 20 µm are examples of normal phase silica lines; kormas C18, kormas C8, and YMC C18 are each examples of reversed-phase silica. While the purpose of an analytical study is to obtain information about a sample, the purpose of this study is to isolate or purify compounds. This is important in today's pharmaceutical industry because new products (synthetic and natural) need to be brought to market as quickly as possible. Thanks to this efficient purification process, the time spent on synthesis can be reduced.

Isolated Phytoconstituents:

Methods for purification:

Phytochemical isolation is the process of purifying plant extracts or active substances into monomer compounds by physical and chemical means. Currently, solvent extraction, precipitation, crystallization, fractionation, salting out, and dialysis are still used separately. However, the separation of phytochemicals has also been greatly improved using modern separation techniques such as ultrafiltration, high-performance chromatography, column and liquid chromatography, and high-pressure chromatography. This chapter describes various techniques in phytochemical isolation and their specific applications.

Solvent method:

1) Acid and basic solvent method

When using heavy acid-base methods, you must consider the strength of the pH, the amount of time the ingredients are in contact, and the heat and time to prevent certain compounds from changing patterns in events. Severe or irreversible conditions in the drug formula.

2) A technique for extracting polarity gradients

This approach aims to achieve separation by using the disparity in partition coefficients within two-phase solvents and the variance in polarity among compounds present in plant extracts. The selection of two-phase solvent systems is often dependent on the polarity of the constituents present in the botanical extract. The ethyl acetate-water system can separate polar compounds, the n-butanol-water system can separate more polar compounds, and the chloroform (or ether)-water system can separate polar compounds.

3) Precipitation method

This approach depends on the formation of solid particles of certain phytochemicals by reacting them with specific reagents, or by causing certain components in the solution to become insoluble by adding specific reagents. Precipitation formation requires the presence of certain components that are crucial for the reversibility of the precipitation process.

Bioactive constituents-

1) Broad isolation methods
2) Techniques for extraction
3) The extraction of plant material is an essential step in the isolation of natural plant
4) By nature, plant matrices are intricate, comprising an array of molecules that different chemical and physical characteristics. Therefore, it's crucial to carefully isolate the matrices from the rest of the plant.
6) A variety of extraction techniques exist.
7) Can be grouped in this chapter; the groups have been divided according to the temperatures they are employed by.
8) Techniques at low or room temperature
9) The cold extraction approach .[13]

Drug for advance technology:

Hibiscus:-

Scientific name:- Hibiscus rosa sinensis.

Family: - Malvaceae**.**

It is referred to as Hibiscus sabdariffa as well. This plant is an annual. A portion of the flower is used to make Karkade, a popular beverage in Egypt. Also can be used in sauce, soup, jam etc. Many plants are used in its production. The medicine is made from flowers. Loss of appetite, colds, heart disease and stroke, upper respiratory tract infections and swelling, fluid retention, stomach pain and blood vessels can be treated with hibiscus.Hibiscus is used as a flavouring in food and drink. It can also be

used to enhance the tea mixture's flavour, aroma, or appearance.Hibiscus's front acid may have laxative properties. According to some researchers, hibiscus contains additional chemicals that may have the ability to reduce blood pressure, lessen uterine, intestine, and stomach spasms, and function as warm-blooded antibiotics. For those with slightly elevated blood pressure, it lowers blood pressure. Tea made from hibiscus flowers may help lower cholesterol in those who have metabolic syndrome or diabetes.[14,15]

RESULT:

Medications made from herbs have the power to improve overall health and boost immunity while reducing negative effects, able to actual save the money

DISCUSSION:

This review indicates that herbal medicine has more advantages than other medications. Because herbal medicine is a natural substance, our bodies can react favourably to it and health can be enhanced. Compared to other pharmaceutical medicines, herbal medicine has fewer side effects.

CONCLUSION:

Throughout the course of human history, plants, herbs, and ethnobotanicals have been used for the purposes of enhancing health and treating diseases. This practice persists in the present day. Contemporary medicine relies on plants and other natural sources, which also have a significant impact on the creation of commercial pharmaceutical products. Globally, plants account for around 25% of prescription drugs. However, in the field of medicine, herbs are often used as alternatives to medicines. Certain individuals choose for herbal medicine as their preferred method of therapy. Certain individuals include herbs as a supplementary means of therapy with conventional drugs. However, in underdeveloped countries, traditional medicine, including herbal medicine, is often the most important and most affordable treatment option. Herbalists should ensure that the products they purchase are safe and labeled, meaning they contain botanical or herbal ingredients.Consumers should be supplied with scientific research-based information on dose, contraindications, and effectiveness. To control the ethical manufacture and distribution of herbal treatments, it is necessary to achieve global legislative harmonisation. Legislation should authorise the proper use of botanical evidence, where it is accessible, to substantiate the usage of the plant in issue. This would allow for the realisation of its potential advantages in treating and promoting public health..

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