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Advanced Herbal Technology: Salvia Rosemarinus

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A B S T R A C T

Herbal drug technology is used for knowledge is important. The use of chromatographic techniques and marker compounds to standardize botanical preparations has limitations because of their variable sources and chemical complexity. DNA-based molecular markers have utility in the fields like taxonomy.. physiology, embryology, genetics, etc. DNA-based techniques have been widely used for authentication of plant species of importance. Pharmacognosy mainly addresses quality related issues using routine botanical and organoleptic parameters of crude drugs, and chemo profiling- assisted characterization with chromatographic and spectroscopic techniques. The new pharmacognosy includes all the aspects of drug development and discovery, where biotechnology-driven applications play an important role. Current focus on chemotype-driven fingerprinting and related techniques requires integration with genotype-driven molecular techniques so that an optimal characterization of botanical materials is possible. This review provides a brief account of various DNA-based technologies that are useful in genotyping and quick identification of botanicals with suitable examples.

Keywords: Salvia Rosemarinus, Herbal , Advanced Technology, Rosemary, Anti anxiety.

1. Introduction

Herbal drug technology is used for converting botanical materials into medicines, where standardization and quality control with proper integration of modern scientific techniques and traditional knowledge is important. The use of chromatographic techniques and marker compounds to standardize botanical preparations has limitations because of their variable sources and chemical complexity. DNA-based molecular markers have utility in the fields like taxonomy.. physiology, embryology, genetics, etc. DNA-based techniques have been widely used for authentication of plant species of importance. Pharmacognosy mainly addresses quality related issues using routine botanical and organoleptic parameters of crude drugs, and chemo profiling- assisted characterization with chromatographic and spectroscopic techniques. The new pharmacognosy includes all the aspects of drug development and discovery, where biotechnology-driven applications play an important role. Current focus on chemotype-driven fingerprinting and related techniques requires integration with genotype-driven molecular techniques so that an optimal characterization of botanical materials is possible. This review provides a brief account of various DNA-based technologies that are useful in genotyping and quick identification of botanicals with suitable examples.

Herbs: - It consists of entire plant or any part of the plant

Herbal Drug:-

• These consist of plants or any part of the plants, usually in unprocessed or crude forms (Crude Drugs) which have medicinal value.

• They include different parts of plants like entire aerial part. Flowers, fruits, seeds, bark, leaves, Roots, rhizomes etc.

• The constituents and their therapeutic activity may be known or unknown drug Preparation

• They are processed form of herbs. They are derived from herbal drug by various techniques like extraction, fractionalization, purification, cone, fermentation and may be in the form of powders, extracts, tinctures, fixed oils, volatile oils, resins, gums, etc.

• They contain a mixture of various constituents. However pure isolated compounds do not come under this category

•Herbal Medicinal Products (Finished Herbal Products) These are the medicinal products which contain exclusive herbal drugs or herbal drug Preparation which are made from one or more herbs

• They may contain excipients in addition to active ingredients

1.1Expert decision:

The best method of determination is to determine the reliability or accuracy of the expert. Usually, specialists have prepared treatments (monograms, reviews, abstracts) on the group in question, and more recent books or botanicals are likely to cover the concepts of singletons. Expert classifier.

Specialists are often found in botanical gardens, herbs, museums, colleges, universities, and more. However, despite its high reliability, this method has problems that require valuable expert time and create delays in identification.

Recognition: It comes close to the expert decision on reliability. This is based on the identifier's extensive past experience with the group of plants in question. In some groups, this is practically impossible.

1.2 Compare:

A third method is to compare an unknown with named specimens, photographs, illustrations or descriptions. Although this is a reliable method, it can be very time consuming or nearly impossible due to lack of suitable literature for comparison. Of course, reliability depends on the accuracy and authenticity of the specimens, illustrations or descriptions used in the comparison

1.3 Comparison:

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2.0 Conventional extraction method

- **NORMAL EXTRACT METHODS**

A. **Soaking alcohol :**

In this procedure, the solid parts of the plant are placed in a stoppered container with all solvents and left to stand for at least 3 days (3-7 days) with frequent stirring, until until the materials dissolve. Be dissolved. The mixture is then filtered (through a sieve/mesh), the liquid is pressed, and the combined liquid is made clear (purified by filtration) or by decantation, after allowing it to stand. When the solvent is water and the soaking time is prolonged, a small amount of alcohol can be added to prevent microbial growth.

B. **Permeability:**

This is the most frequently used process to extract the active ingredients in the preparation of tinctures and liquid extraction. Plant material is collected in an osmotic tube plugged with cotton or fitted with a filter and faucet lock. The solvent was added to the plant material and allowed to stand for about 4 hours in a tightly closed container, after which the mass was packed and the top of the color filter closed. The whole system was kept for 24 h at room temperature, and the solvent along with the extracted material was collected by opening the lower lid and the mixed liquid was clarified by filtration or by settling followed by decantation.

C. **Digestion:**

This is a form of immersion in which mild heat (40-600°C) is applied during the extraction process. It is used when moderately high temperatures do not cause discomfort. This process can be modified by mixing the material with the solvent using a magnetic stirrer, mechanical stirrer or occasional hand shaking. After 8-12 hours the extract is filtered and new solvent is added and the procedure is repeated until all desired products are extracted.

D. Transfusion:

In this extraction process, the plant material is soaked for a short time with cold or boiling water. It is a dilute solution of the readily soluble components of the crude drug

3. NON - CONVENTIONAL EXTRACTION METHOD

Super critical fluid extraction

This is the most technologically advanced mining system. Supercritical fluid extraction (SFE) involves taking gases, usually CO2, and compressing them into a dense liquid. This liquid is then pumped through a cylinder containing the material to be extracted. From there, the extract-filled liquid is pumped into a separation chamber, where the extract is separated from the gas and the gas is recovered for reuse. The solvent properties of CO2 can be controlled and adjusted by varying pressure and temperature. The advantage of SFE is that there is no solvent residue left because CO2 is completely evaporated. SFE is the process of separating one component (extractor) from another (matrix) by using a supercritical fluid as the extraction solvent. Extraction is usually performed from a solid substrate, but can also be performed from a liquid. SFE can be used as a sample preparation step for analysis or on a larger scale to remove undesirable materials from a product (e.g., decaffeinated) or to obtain a desired product (e.g., decaffeinated) e.g. essential oils). These essential oils may include limonene and other pure solvents. Carbon dioxide (CO2) is the most widely used supercritical fluid, sometimes denatured with co-solvents such as ethanol or methanol. The supercritical carbon dioxide extraction conditions are above the critical temperature of 31°C and the critical pressure of 74 bar. Adding modifiers can change this a bit. The discussion below will mainly deal with CO2 extraction, unless otherwise

specified. Supercritical fluid extraction (SFE) is a method in which supercritical fluid as the extraction medium is added to substances containing the target

Supercritical carbon dioxide as extraction medium offers many advantages in various fields, including short extraction times, simple operation and improved extraction efficiency compared to solvent extraction methods. Organic lips. In addition, it is much easier to remove the solvent after extraction, allowing for more precise determination of component concentrations. Because the critical temperature of carbon dioxide is only 31°C. Extraction can be close to room temperature. Alternatively, extraction can be performed in an oxygen-free carbon dioxide environment. This means that the method can be used for substances that are temperature sensitive or prone to oxidation. Supercritical carbon dioxide is effective at dissolving oil-soluble or weakly polar compounds, but it can be adapted to extract highly polar compounds by adding alcohols such as methanol or organic solvents. Such as acetonitrile and tetrahydrofuran as auxiliary solvents.

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Ultrasonic Extraction:-

In this process, natural compounds are released from plant tissues by high frequency sound, which damages the cell walls. Ultrasonic assisted extraction can be used with mixtures of immiscible solvents such as hexane with methanol/water. Progress. Generate heat so that heat-stable compounds can decompose in case the extraction vessel is placed in an ice bath to reduce the temperature. Ultrasonic extraction is the preferred technique for isolating bioactive compounds from plants. Sonication achieves complete extraction and thus obtains a higher extraction yield in a very short extraction time. As an efficient extraction method, ultrasonic extraction saves time and money, and produces high-quality extracts, used for foods, supplements and pharmaceuticals. Ultrasonic Mining Ultrasonic extraction is used in the food, nutritional supplements and pharmaceutical industries to release bioactive compounds such as vitamins. Polyphenols, polysaccharides, cannabinoids and other phytochemicals from plants. Ultrasonic-assisted tooth extraction is based on the working principle of acoustic or ultrasonic cavitation. Ultrasonic extraction of plants like CBD from cannabis.

Microwave assisted extraction-

It is simply known as conventional microwave combination microwave and solvent extraction. The revolution in organic synthesis has been fueled by microwave-assisted organic synthesis (MAOS), whereby small molecules are transformed into large polymers over a period of time. Short. Microwave heating of the solvent and plant tissue increases the extraction kinetics to facilitate separation of the analyte from the sample matrix in the solvent Microwave radiation interacts with the dipoles of polar and polar materials causing produce heating near the surface of the material and heat is transferred by conduction. The dipole action of molecules caused by electromagnetic microwaves breaks hydrogen bonds; improve the mobility of dissolved ions and promote solvent penetration into the matrix. In non-polar solvents, poor heating occurs because energy is transferred only by dielectric absorption MAE is a common technique to extract active ingredients from medicinal plants, using microwave energy. To heat the solvent containing the sample, thereby

solid phase extraction (SPE):

Fast, economical and sensitive technique using different types of cartridges and discs, with a wide range of adsorbents, in which solute molecules preferentially bind to the stationary phase in one step. Normal-phase, reversed-phase and ion-exchange solid-phase extractors are available, for example, with the Sep – Pak CIS (reverse phase) box, which can remove polar components while weakly polar components are removed. Retained can be subsequently eluted. We offer a wide range of Solid Phase Extraction (SPE) products in different polarities and chemicals. A wide selection of Bond eluent sorbents is available in cartridges and well plates as well as bulk sorbents. Frits, adapter covers, drum cartridges for custom packaging, and SPE cartridges can also be purchased online.

Isolation method:-

Chromatography –

Chromatography is a technique used to separate mixtures. The mixtures are separated by their distribution between two phases: stationary phase and mobile phase. The process of separating components of a mixture by passing the mixture as a solution or suspension through a fixed medium in which the components move at different speeds.

Chromatography has two stages

Mobile phase :the fluid in which the mixture to be separated is dissolve is known as mobile phase

Stationary phase : the phase over which mobile phase is passed is known as stationarnary phase

Types of chromatography –

1 paper chromatography

2 ion exchange chromatography

3 gel permeation chromatography

4 affinity chromatography

5 column chromatography

6 TLC

7 gas chromatography

8 HPLC

Thin Layer Chromatography

It is a technique used to isolate non-volatile mixtures. The experiment is conducted on a sheet of aluminum foil, plastic, or glass which is coated with a thin layer of adsorbent material. The material usually used is aluminum oxide, cellulose, or silica gel. On completion of the separation, each component appears as spots separated vertically. Each spot has a retention factor (R) expressed as Rf dist. travelled by sample dist.: travelled by solvent. The factors affecting retardation factor are the solvent system, amount of material spotted, absorbent and temperature. TLC is one of the fastest, least expensive, simplest and easiest chromatography technique.

Principle:-

Like other chromatographic techniques, thin-layer chromatography (TLC) depends on the separation principle. The separation relies on relative affinity of compounds towards both the phases. The compounds in the mobile phase move over the surface of the stationary phase. The movement occurs in such a way that the compounds which have a higher affinity to the stationary phase move slowly while the other compounds travel fast. Therefore, the separation of the mixture is attained. On completion of the separation process, the individual components from the mixture appear as spots at respective levels on the plates Their character and nature are identified by the suitable detection techniques

Procedure –

1) Before starting a thin layer chromatography experiment, understand the difference Components required to complete the process as well as the stages involved stationary phase is coated on its surface as a thin layer. The stationary phase on the plate has a fine particle size and is also of uniform thickness

2) The thin layer chromatography chamber is used to develop the chromatographic plates. It is responsible for maintaining a stable indoor environment that will help the spots develop. In addition, it prevents evaporation of the solvent and keeps the whole process dust-free

3) Thin layer chromatography mobile phase – The mobile phase is the moving phase and consists of a mixture of solvents or a single solvent. This stage must be seed-free.

4) Filter paper for thin layer chromatography It must be placed inside the chamber. It is moistened in the mobile phase.

Applications:-

The qualitative testing of Various medicines such as sedatives, local anesthetics, anticonvulsant tranquilizers, analgesics, antihistamines, steroids, hypnoties is done by TLC.

- TLC is extremely useful in Biochemical analysis such as separation or isolation of biochemical metabolites from its blood plasma, urine, body fluids, serum, etc.
- Thin layer chromatography can be used to identify natural products like essential oils or volatile oil, fixed oil, glycosides, waxes, alkaloids, etc.
- It is widely used in separating multicomponent pharmaceutical formulations,
- It is used to purity of any sample and direct comparison is done between the sample and the authentic sample.
- It is used in the food industry, to separate and identify colors, sweetening agent, and Preservatives
- It is used in the cosmetic industry.
- It is used to study if a reaction is complete

COLUMN CHROMATOGRAPHY

Column chromatography separates substances based on differential adsorption of compounds to the adsorbent as the compounds move through the column at different rates which allow them 10 get separated in fractions. This technique can be used on a small scale as well as large scale to purify materials that can be used in future experiments. This method is a type of adsorption chromatography technique

Principle:

When adding the mobile phase and the mixture to be separated from the top of the column, the movement of the individual components in the mixture takes place at different speeds. Components with lower adsorption and affinity for the stationary phase migrate faster than the greater adsorption and affinity for the stationary phase. The fast-moving components are removed first while the slow-moving components are eluted last. The adsorption of solute molecules on the column is reversible. The migration rate of the components is expressed by: Rf the distance traveled by the solute, the distance traveled by the solvent Rf is the hysteresis factor

Types of column chromatography:-

1.Adsorption column chromatography: Adsorption chromatography is a separation technique in which the components of a mixture are adsorbed on the surface of the adsorbent.

2. Partition chromatography: The stationary phase as well as the mobile phase are liquids in partition chromatography.

3. Gel column chromatography: In this chromatographic method, separation takes place through a column filled with gel. The stationary phase is the solvent held in the interstitium of the solvent.4. Column-exchange chromatography: chromatographic technique in which the stationary phase is always an ion-exchange resin

HPTLC

The HPTLC technique is an automated and sophisticated form of thin-layer chromatography with outstanding and advanced separation efficiency and detection limits and is often an exceptional alternative to high-performance liquid chromatography (HPLC) and high-performance liquid chromatography (HPLC). Gas chromatography (GC). Layer chromatography is also known as planar chromatography or planar chromatography.

Principle: -

The HPTLC machine works on the same principle as TLC, where the separation principle is adsorption. The mobile phase or solvent flows by capillary. Analytes migrate according to their affinity for the stationary phase (adsorbent). The higher-affinity component moves more slowly towards the stationary phase. The low-affinity component rapidly transitions to the stationary phase. Then, on a chromatographic plate, the components are separated

1 Sample preparation: -

This requires a high concentration of solution because much less sample is required. Plate solvents should be non-polar, volatile. Polar solvents are commonly used to dissolve reverse-phase chromatographic samples

. 2. Selection of chromatographic layers: - HPTLC layers are available as very fine particle size silica gel pre-layers which are widely used as adsorbents.

3. Pre-wash: For steam or volatile impurities, the panels must be cleaned. It can be cleaned with a suitable solvent such as methanol.

4. Conditioning: -Discs are placed in an oven at 120C for 15 to 20 minutes to conduct Conditioning.

5. Sample application: Sample spot size no more than 1 mm in diameter. There are different methods for sample positioning in HPTLC. One is a self-loading capillary in which a small amount of sample can be introduced into the HPTLC plate.

6. Preconditioning: - Saturation is required for highly polar mobile phases although saturation is not required for low polarity mobile phases.

7. HPTLC Mobile Phase – Through trial and error, the mobile phase of suitable solvents should be selected.

8. Chromatographic expansion: The linear expansion method in high performance thin layer chromatography is the most common technique here, the chromatographic identity is positioned vertically in a suitable container with the solvent or mobile phase. The mobile phase is usually capillary grown and both sides can produce chromatograms.

9. Spot detection and scanning: HPTLC devices are connected to computers and data loggers. Point developments are considered as peaks at the selected UV region wavelengths. The heights and areas of the peaks are determined by the instrument and recorded as a percentage

Applications:

- High-performance thin-layer chromatography is used to analysis of molecules in both Qualitative and quantitative terms.
- HPTLC can estimate the concentration of components although TLC can only separate components
- HPTLC can analyze a complex structure or a very small number of compounds.
- This method is used in the food industry to evaluate nutrients, beverages, vitamins, and pesticides in fruit, vegetables, and other foodstuffs.
- HPTLC is useful in forensic detection of substances, including adulteration, overdose. Counterfeit drugs, and drug misuse.

- To identify the substances including drug abuse, overdose, adulteration, counterfeit drugs
- It is used forensic dept.

DEMAND FOR STANDARDIZATION OF HERBAL FORMULA: -

Herbal formulations can generally be standardized for drug formulation using raw materials collected from different localities, and comparative chemical efficacy of different formulation batches should be observed. Preferably clinically effective preparations should be selected. All common physical, chemical and pharmacological parameters are checked for all batches to select the final product and validate the entire manufacturing process.

Standardization is an important aspect for maintaining and evaluating the quality and safety of multidrug formulations as they are combinations of multiple herbs to achieve the desired therapeutic effect. Standardization minimizes variation between batches; ensure the safety, efficacy, quality and acceptability of various formulations. Mandatory herbal formulation standardization. In addition, various parameters such as pharmacodynamics, pharmacokinetics, dosage, stability, and shelf life were studied. Toxicological evaluation, chemical profiling of herbal formulations is considered necessary. Equally important is heavy metal contamination, Good Agricultural Practices (GAP) in herbal medicine standardization. , the majority of Ayurvedic formulations are prepared from herbs. The primary responsibility of regulatory agencies is to ensure that consumers receive drugs that guarantee purity, safety, potency, and effectiveness. This task is undertaken by the regulatory authorities through strict adherence to the various quality standards prescribed for raw materials and finished products in the pharmacopoeia that control the manufacture of formulations using practices and forms of production through “good manufacturing practices” imposed by law

WHO GUIDELINES FOR QUALITY STANDARD HERBAL FORMULA:-

The World Health Organization (WHO) developed a traditional medicine strategy for the period 2002-2005 , which was then implemented within the framework of the WHO pharmaceutical strategy for the period 2002-2005. 2004-2007. One of the main goals is to promote the safety, effectiveness and quality of traditional medicines. There are many measures to control herbal drugs, in which the first important step is to control the quality of herbal drugs and herbal ingredients.

1) Quality control of raw drugs, herbal ingredients and finished drugs

2) Evaluation of stability and shelf life.

3) Safety Assessment; Safety documentation based on experience or toxicity studies

4) Efficacy assessment by ethnomedical information and biological activity assessment

Reference to the pharmacological properties: Biological activity profiles, bitterness value, hemolytic index, astringency, swelling factor, foaming index etc.

Reference to physicochemical properties of drugs: Physical and chemical identification, chromatographic fingerprint, ash value, extraction value, moisture, volatile oil and alkaloid test, estimation protocol quantification, etc

Toxicological details: pesticide residues, heavy metals, microbial contamination such as total live bacteria, pathogens such as E. coli, Salmonella, P.aeroginosa, S.aurea, Enterobacteriaceae. Microbiological parameter: It includes total viable bacteria, total mold count, total enteric bacteria count. The limiter can be used as a quantitative or semi-quantitative tool to determine and control the amount of impurities such as reagents used when extracting various herbs, impurities directly from the production vessel. Output and solvent.

Drug Used in Advanced Herbal Technology

Rosemary plant

Fig No. 1 Salvia Rosemarinus

Rosemary is a perennial shrub and usually grows to about 1 meter (3.3 feet) tall, although some plants can grow up to 2 meters (6.6 feet) tall. The linear leaves are about 1 cm (0.4 inches) long and look a bit like small, curved pine needles. They are dark green and glossy on the upper side, white underside, and the leaf margins curled. The small blue flowers grow in clusters in the leaf axils and attract bees. Rosemary is fairly resistant to most pests, although it is susceptible to some fungal infections, such as powdery mildew, in humid climates.

kingdom	plantea
genus	salvia
species	s.rosmarinus
family	lamiaceae

CHEMICAL COMPOSITION OF PLANT:-

The main components of the oil are p-cymene (44.02%), linalool (20.5%), gamma-terpinene (16.62%), thymol (1.81%), beta-pinene (3.61%)), alpha-pinene (2.83%). and eucalyptol (2.64%) Rosemary (Salvia Rosmarinus), native to the Mediterranean region, rosemary has been naturalized to much of 'Europe and is widely grown in gardens in the Mediterranean region. warm post. The leaves have a pungent, slightly bitter taste, dried or fresh, and are often used to flavor foods, especially lamb, duck, chicken, sausages, seafood, stuffing, stews, soups, and potatoes. , tomatoes, radishes and other vegetables. , as well as drinks. The classification of rosemary has been controversial and it was formerly placed in the genus Rosmarinus as Rosmarinus Officinalis. See also Salvia. Phytochemical studies on this salvia species have reported the presence of different types of bioactive compounds, including polyphenols, phenolic diterpenes and triterpenes. Rosmarinic acid, carnosic acid, carnosol, caffeic acid, betulinic acid and ursolic acid are the main ingredients

Medicinal uses of rosemary

• **For stress:** Rosemary oil's anti-stress properties make it helpful in managing stress. Inhaling rosemary essential oil lowers cortisol (the stress hormone) while increasing dopamine (a neurotransmitter). It helps to reduce stress and prevent or cure mental disorders.

• **For Mental Fatigue:** Aromatherapy with rosemary essential oil can reduce mental fatigue and exhaustion.

• **For opioid withdrawal:** Rosemary may help relieve symptoms of opioid withdrawal. Due to its anti-inflammatory and psychostimulant properties, rosemary may help relieve opioid withdrawal symptoms such as muscle twitching, convulsions, and musculoskeletal discomfort. However, these effects are yet to be proven, so you should follow your doctor's advice before using rosemary for this purpose.

• **To improve memory:** Rosemary's enhancing qualities can help you improve your memory. This can stimulate the production of specific molecules in the brain and potentially improve memory and cognitive performance. However, you must consult your doctor and follow his advice before consuming rosemary because of these benefits

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