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AN OVERVIEW OF PLANT MEDICINES IN NOVEL FORM

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ABSTRACT

Plants or plant parts that have been converted into pharmaceuticals by means of simple processes involving harvesting, collecting, drying, extracting, preparation, evaluation and storage is known as Phytopharmaceuticals or Herbal drugs. Other crude products derived from plants, such as essential oils, fatty oils, resins, and gums also include in herbal formulations. There is increasing awareness and general acceptability of the use of herbal drugs in today's medical practice. Evaluation of herbal drug is an important tool in the formulation of high quality herbal products as there is increase in demand of these formulations all over the world. Herbal medicines widely used in health-care in both developed and developing countries are complex chemical mixtures prepared from plants and are limited. An overview covering various techniques employed in extraction, characterization, formulation, evaluation of herbal medicines is discussed. This review seeks to enlighten the knowledge in novel herbal medicine. On the need to establish quality parameters with the help of advanced analytical tools and well defined standardization methods in ensuring the safety of the global herbal market.

KEYWORDS: Herbal, standardization, evaluation, types of herbal forms, novel.

INTRODUCTION

Herbs as medicine is the ancient form of healthcare known to world. Medicinal plants have played a key role in health. In spite of the great advances observed in modern medicine in recent decades, plants still make an important contribution to health care.

There are at least 120 distinct chemical substances derived from plants that are considered as important drugs currently in use in the world, while several other drugs are simple synthetic

modifications of the natural products. Herbs include crude plant material, such as leaves, flowers, fruit, seeds, stems, wood, bark, roots, rhizomes or other plant parts, which may be entire, fragmented or powdered. Herbal materials include, in addition to herbs, fresh juices, gums, fixed oils, essential oils, resins and dry powders of herbs. Herbal preparations are the basis for finished herbal products and may include comminuted or powdered herbal materials, or extracts, tinctures and fatty oils of herbal materials.

WHO framed specific guidelines for the assessment of the safety, efficacy and quality of herbal medicines as a prerequisite for global harmonization are of utmost importance.

Herbal preparations are the basis for finished herbal products. Finished herbal products are medicinal products containing exclusively herbal drugs (active substances) and herbal drug preparations. They may contain excipients in addition to the active ingredients or may contain natural organic or inorganic active ingredients not of plant origin (e.g., animal materials and mineral materials). Finished products or mixed products to which chemically defined active substances have been added, including synthetic compounds and/or isolated constituents from herbal materials, are not considered to be herbal.

Analytical methods, such as photometric analysis, TLC, HPLC, GC, MS or GS/MS, can be employed to establish the constant composition of herbal preparations. For content, sometimes markers can be used for control purposes because in most herbal drugs the active constituents are unknown. In other cases, where no active constituent or marker can be defined for the herbal drug, the percentage extractable matter with a solvent may be used as a form of assay. The choice of the extracting solvent depends on the nature of the compounds involved, e.g., hot water for herbal tea, steam distillation is suitable for essential oils. Complex nature of herbal drugs, unknown active principle, unavailability of selective analytical methods or reference compounds, chemical and natural variability in the plant materials as well as in source and quality of the raw material, methods of harvesting, drying, storage, transportation, and processing etc. are some of the problems that influence the quality of herbal drugs. Strict guidelines have to be followed for the successful production of a quality herbal drug.

Quality control of herbal medicines involve several steps. The source and quality of raw materials, good agricultural practices and manufacturing processes are certainly essential

steps for the quality control of herbal medicines and play a pivotal role in guaranteeing the quality and stability of herbal preparations.

Quality refers to the status of a drug and is based on Their Collection, Preservation, and Preparation three important pharmacopoeial definitions such as identity, purity, and content of active constituents.

Purity evaluation includes ash values, contaminants, heavy metals, microbial contamination, aflatoxins, radioactivity, and pesticide residues.

It includes safety in herbal drugs, toxicity in herbals and their interactions.

Safety in herbal drugs: Major difference in the assessment of quality, safety and efficacy would hinder free circulation of herbal medicinal products may represent a risk for consumers. The selection of seeds, condition of cultivation, and harvesting represent an important aspect in producing a reproducible quality of herbal drugs.

Toxicity in herbals and their interactions: A part from efficacy, FDA is also charged with determining the safety of drug products, and not all botanicals/herbals harmless. In addition to the problem of incorrect plant identification, some mixtures may be toxic, particularly if they are misused. Important should be given to continuous surveillance and of actively requesting information rather than just collecting reports and even this can be considered as national program.

Analytical evaluation technique in herbal drugs: analytical determination of foreign matter, plant ash, heavy metals, microbial contaminants and aflatoxins, etc. Potentially hazardous contaminants and residues in herbal medicines may be grouped as chemical, biological, agrochemical residues, residual solvents. It is obvious that the content is the most difficult one to assess, since in most herbal drugs the active constituents are unknown. Sometimes markers can be used which are, by definition, chemically defined constituents that are of interest for control purpose, independent of whether they have any therapeutic activity or not. To prove identity and purity, criteria such as type of preparation sensory properties, physical constants, adulteration, contaminants, moisture, ash content and solvent residues have to be checked. The correct identity of the cured herbal material, or the botanical quality, is of prime importance in establishing the quality control of herbal drugs.

Organoleptic or macroscopic evaluation: Organic evaluation of drugs by means of organs of sense (skin, eye, tongue, nose, and ear) or microscopic evaluation which include evaluation of drugs by color, odour, taste, size, shape, and special feature, like touch, texture, etc. it is the technique of qualitative evaluation based on the study of morphological and sensory profile of whole drugs.

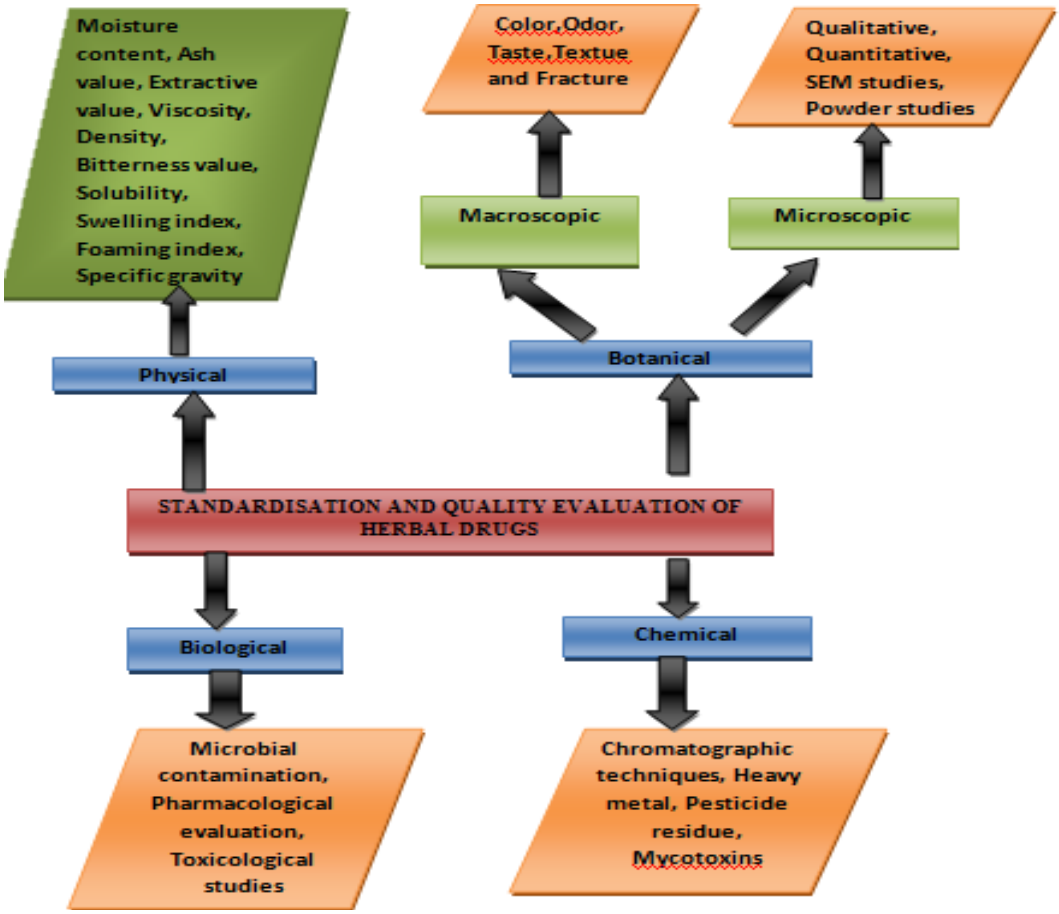
The fractured surfaces in cinchona, quillia, and cascara barks and quassia wood are important characteristics. Aromatic odor of umbelliferous fruits and sweet taste of liquorices.

Microscopic evaluation: It involves detailed examination of the drugs and it can be used to identify the organized drugs by their known histological characters. It is mostly used for qualitative evaluation of organized crude drugs in entire and power forms with help of microscopic. Using microscope detecting various cellular tissues, trichomes, stomata, starch granules, calcium oxalate crystals and aleuronic grains are some of important parameters which play important role in identification of certain crude drugs.

Standardization of Herbal Medicines

Standardization involves adjusting the herbal drug preparation to a defined content of a constituent or a group of substances with known therapeutic activity by adding excipients or by mixing herbal drugs or herbal drug preparations because botanical extracts made directly from crude plant material show substantial variation in composition, quality, and therapeutic effects.

Standardized extracts are high-quality extracts containing consistent levels of specified compounds, and they are subjected to rigorous quality controls during all phases of the growing, harvesting, and manufacturing processes.



Herbal Formulations

Commonly-available herbal dosage forms include decoctions, herbal teas, tinctures, glycerites, oxymels, and herbal soaps, herbal tablets, herbal capsules, herbal creams and ointments. Plants and herb extracts vary in the solvent used for extraction, temperature, and extraction time, and include alcoholic extracts, vinegars, hot water extracts, long-term boiled extract of roots or bark (decoctions), and cold infusion of plants.

The ideal solvent for a certain pharmacologically active constituent include high selectivity for the compound to be extracted, high capacity for extraction in terms of coefficient of saturation of the compound in the medium, nonreactive with the extracted compound or with other compounds in the plant material, low price, harmless to man and to the environment, completely volatile. Aliphatic alcohols (up to 3C) or mixtures of the alcohols with water, are the solvents with the greatest extractive power for almost all natural substances of low molecular weight such as alkaloids, saponins, and flavonoids. Ethyl alcohol used for obtaining tinctures and fluid, soft and dry extracts. The ethanol–water mixture induces swelling of the plant particles and increases the porosity of the cell walls and thus facilitates

the diffusion of extracted substances. For extraction of barks, roots, woody parts and seeds the ideal alcohol: water ratio is about 7:3 or 8:2. Herbal internal preparations include infusions, decoctions, tinctures, macerations, percolation, digestion, inhalation of powdered plants, steam inhalation, aromatherapy, dry preparations etc. and washes, compresses, poultices, salves and balms are the main external preparations.

The growing demand for herbal medicinal products has made large scale manufacture of these products a routine. Large scale production may result in longer storage times and possible product deterioration.

Decoctions

Decoctions are made by boiling the herb in water for a period of time to extract soluble constituents. The water decoction of a mixture of 2-12 herbal materials is the commonest traditional herbal dosageform. Decoctions are normally suitable for hard plant materials such as barks and roots and may also be prepared from herbs with sparingly soluble constituents. Decoctions are normally intended for immediate use, ideally within a 24-hour period, with about a 72- hour maximum limit if stored in a very cool place. Excipients such as preservatives may be used in decoctions to prevent spoilage if long term storage is desired. In this case, the stability of the preparation should be conducted to determine the shelf-life of the product at a particular storage condition. Decoctions may be sweetened using a syrup or honey.

Tinctures

Tinctures are normally alcohol and water extracts of plant materials. Many plant constituents dissolve more easily in a mixture of alcohol and water than in pure water. The preparation of tinctures by maceration of herbal parts in water-ethanol solutions results in the extraction of many structurally diverse compounds with varying polarities. There is the added advantage of the alcohol in a tincture being a preservative, allowing the extract to be kept for several years. The alcohol content of the finished extract needs to be at least 20% v/v to adequately preserve it. Most commercially produced tinctures have a minimum alcohol content of 25% v/W.

Herbal glycerites

Glycerites are made like tinctures but in this instance, glycerine is used in the extraction process instead of a mixture of alcohol and water. A glycerite will keep well as long as the concentration of glycerine is at least 50% to 60% in the finished product. The shelflife is only

about six months to two years. Glycerine should not be the solvent of choice for herbs that contain resins and gums; alcohol is needed to properly extract the active constituents of these herbs. Glycerine is particularly good in making medicines for children, and for soothing preparations intended for the throat and digestive tract, or coughs. Glycerites are normally less potent than alcoholic extracts and have a shorter shelf life.

Herbal alcoholic beverages (bitters/wines)

Herbal alcoholic beverages are normally ethanolic or hydroethanolic extracts of herbal materials. Herbal beverages in the form of spirits and liquors are widely used. They are normally meant for oral use as a beverage. The herbal material present in the product confers a certain degree of medicinal effect depending on the type and quantity used in the preparation. In addition, the presence of the alcohol in the preparation normally confers a preservative effect, The antioxidant, antibacterial and antifungal activity.

Oxymels

An oxymel is a specialized sweet and sour herbal honey preparation, a sweet honey mixed with a little sour vinegar. This combination may be used as a carrier for herbal infusions, decoctions, concentrates, tinctures, and other herbal extracts. Oxymels are used as a gargle or as a vehicle for intense herbal aids such as Garlic, Cayenne, and Lobelia. The stability of oxymels may depend on the content of honey, vinegar.

Herbal capsules

Herbal capsules normally consist of hard shelled gelatin capsules with the plant material finely milled and sifted and filled into shell or extracts of the herbal material(s) with appropriate excipients such as fillers. The stability of herbal capsule preparations is relatively better when compared to aqueous preparations such as decoctions and infusion.

Herbal tablets

Herbal tablets are normally designed for oral use with various herbal materials incorporated for a particular therapeutic effect. using excipients. Like the herbal capsules, incorporation of the herbal material may be done with the finely powdered and sifted plant material or extracts from the plant materials using various solvents which are suitable for oral use. The stability of herbal tablets should be determined as the shelf life of the tablet is affected by storage conditions.

Herbal ointments

Ointments are semi-solid, greasy preparations for application to the skin, rectum or nasal mucosa. Herbal ointments normally have the plant material(s) either in finely sifted or extracted form incorporated into the base. Herbal Ointments should not be used for deep wounds. Ointments are relatively stable when compared with other liquid dosage forms. However, the presence of herbal materials in an herbal ointment may lead to quick deterioration of the product. The stability of herbal ointments is necessary to provide appropriate labelling instructions for storage and shelf-life.

Herbal balms

These may be classified as ointments meant for massage into the skin for relief of body aches and pains. They normally contain herbal materials which provide a rubefacient effect on the skin and by so doing cause relief of pain. The stability of herbal balms may be compared to that of herbal ointments since the bases for preparation are similar.

Herbal creams

Herbal creams normally contain the herbal material in either finely sifted form or incorporated as an extract. Creams normally contain antimicrobial preservatives due to the presence of water in the base and may have a relatively shorter shelf life compared to ointments. Some herbalists tend to confuse creams and ointments. Herbal creams are those which have a hydrophilic base. If the base is purely hydrophobic, then the preparation must be qualified as an ointment.

Herbal oils

These are suspensions or solutions of herbal materials in an oily vehicle. Infused oils are often called macerated oils, and should not be confused with essential oils, which are aromatic oils isolated by distilling the plant material. These preparations are normally meant for external or topical use as liniments. In a few cases, however, some of these preparations may be meant for oral use. Herbal materials such as leaves with essential oils may normally be found incorporated in these oils. The stability and shelf life of a herbal oil depends largely on the type of oil being used in the extraction process since the stability of various essential oils differs.

Herbal soaps

Herbal soaps have the herbal materials incorporated in the detergent base. These herbal materials normally have an antifungal and antibacterial effect on the skin and helps in cleansing of the skin. Herbal soaps arenormally meant for microbial skin conditions such as dandruff, eczema, ringworm and boils. Soaps have a relatively longer shelf-life when preservatives or antioxidants are added.

Herbal pastes

Pharmaceutically, topical pastes are ointments which may contain as much as 50% powder dispersed in a fatty base. Herbal pastes may contain the herbal ingredient dissolved or dispersed in a base (fatty base if it is meant for topical use or a more aqueous stiff base if it is meant for oral use as is done in herbal toothpaste). Herbal oral pastes should contain only herbal materials that are safe for oral use.

Herbal suppositories

Herbal suppositories are normally prepared by mixing powdered and finely sited herbs or extracts with cocoa butter as the base. They are normally used to soothe inflamed surfaces of the nasal mucosa and aid the healing process; reduce swollen membranes and overcome pus filled discharge or to act as a laxative to treat constipation.

Herbal pessaries

Pessaries are similar to suppositories but are meant for insertion into the vagina for local or systemic effects. Herbal pessaries may also be made using a glycerated-gelatin base which dissolves at body temperature to release herbal ingredients for the desired local or systemic effects.

Herbal poultices and plasters

Poultices are made by mashing fresh herbs, wrapping in a gauze and applied to an affected area of the skin after the temperature is suitable for application. Poultices may be used externally to relax muscles or to ease minor skin eruptions, poison ivy, insect bites, superficial wounds, and inflammation. Since they are normally made from fresh herbs, they should be used immediately and cannot be stored.

Herbal liniments

Liniments are for external use for aches and pains. Herbal liniments are normally used as warming massage mediums to relieve soreness in muscles and ligaments. Heat-inducing herbs such as cayenne are normally used in the preparation of liniments together with alcohol for extraction or a mixture of alcohol and/or oil. Liniments should not be used on cuts or broken skin.

Herbal lozenges

A number of formulations have been developed to pleasantly and slowly release medicinal properties in the mouth. Lozenges may be prepared by the use of the powdered herbs together with excipients such as sugar and honey to provide the sweet taste, gums (Acacia and tragacanth) and the white of an egg in some instances. The lozenges normally may be used to sooth soreness in the throat as well as help in the treatment of throat infections. Lozenges normally do not contain disintegrating agents.

General methods for stability testing

The stability of herbal medicinal products may be determined based on physical and sensory tests, microbial tests and chromatographic/ spectral tests.

Physical and sensory methods

Herbal products, like pharmaceutical products, usually undergo physical changes during storage. These changes though not usually quantitative in nature may be used as a guide to check if the products are deteriorating. These include evaluation of changes in parameters such as colour, taste, odour, clarity, specific gravity, total solid residue, viscosity, the moisture content of powders, dissolution and disintegration tests for capsules and tablets.

Microbial tests

Microbial contamination or load tests and preservative efficacy or challenge tests (where preservatives are used) of finished herbal products are essential in the determination of stability and shelf life of the product. Key factors affecting the efficacy of the antimicrobial preservative added are the active ingredient, excipients, storage conditions, the container and its closure. Analyses of such parameters with time allows the tracing of stability of the product and subsequent prediction or estimation of shelf-life.

Criteria 'A' represents herbal medicinal products containing herbal drugs, with or without excipients, intended for the preparation of infusions and decoctions using boiling water (for example herbal teas, with or without added flavourings).

'B' represents herbal medicinal products containing, for example, extracts and/or herbal drugs, with or without excipients, where the method of processing (for example, extraction) or, where appropriate, in the case of herbal drugs, of pre-treatment reduces the levels of organisms to below those stated for this category).

'C' represents herbal medicinal products containing, for example, extracts and/or herbal drugs, with or without excipients, where it can be demonstrated that the method of processing (for example, extraction with low strength ethanol or water that is not boiling or low-temperature concentration) or, in the case of herbal drugs, of pre-treatment, would not reduce the level of organisms sufficiently.

Chemical stability

Chromatographic methods used to assess the chemical stability of herbal products include thin layer chromatography (TLC), high (ultra) performance liquid chromatography (HPLC, UPLC), high performancethin layer chromatography (HP-TLC), gas liquid chromatography (GLC), etc., while spectral methods used include ultraviolet-visible (UV-VIS) spectroscopy, infrared (IR) spectroscopy, nuclear magnetic resonance (NMR) and mass spectroscopy (MS). These techniques allow tracing of changes which may occur during storage of a complex mixture of biologically active substances contained in herbal materials. Comparisons of appropriate characteristic/fingerprint chromatograms allow the determination of the stability of identified active ingredients (if any) and other substances present in the finished herbal product (which may appear as markers).

Evaluation of stability data

Depending on the availability of equipment, selected tests such as TLC, HPLC, HPTLC, UV-Visible spectrophotometry may be used to quantify selected markers as well as determine the levels of degradation products. It is not expected that every listed test be performed at each time point. The list of tests presented for each dosage form is not intended to be exhaustive, nor is it expected that every listed test be included in the design of a stability protocol for a particular finished herbal product.

Chemical evaluation: Most of drugs have definite chemical constituents to which their biological or pharmacological activity is attributed. Qualitative chemical test are used to identify certain drug or to test their purity. Isolation, purification, identification of active constituents is based on chemical methods of evaluation.

- Evaluation test of resins : acid value, sulphated ash
- Evaluation test of balsams: acid value, saponification value, bester values.
- Evaluation test of volatile oils : acetyl and ester values

The qualitative chemical tests are useful in identification of chemical constituents and detection of adulteration.

Physical evaluation: Physical constants are sometimes taken into consideration to evaluate certain drugs. These include moisture content, specific gravity, optical rotation, refractive, melting point, viscosity and solubility in different solvents. All these physical properties are useful in identification and detecting of constituents present in plants.

Biological evaluation: Some drugs have specific biological and pharmacological activity which is utilized for their evaluation. Actually this activity is due to specific type of constituents present in the plant extract. For evaluation the experiments were carried out on both intact and isolation organs of living animals. With the help of bioassays, strength of drug in its preparation can be evaluated.

Novel Herbal Formulations: Herbal medicines have been widely used all over the world since ancient times and have been recognized by physicians and patients for their better therapeutic value as they have fewer adverse effects as compared with modern medicines. The drugs of ayurvedic origin can be utilized in a better form with enhanced efficacy by incorporating in modern dosage forms. However, phytotherapeutics need a scientific approach to deliver the components in a novel manner to increase patient compliance and avoid repeated administration. This can be achieved by designing novel drug delivery systems for herbal constituents. Novel drug delivery systems not only reduce the repeated administration to overcome non-compliance, but also help to increase the therapeutic value by reducing toxicity and increasing the bioavailability and so on. Recently, pharmaceutical scientists have shifted their focus to designing a drug delivery system for herbal medicines using a scientific approach. The novel research can also aid in capturing as well as to remain in the market. But there are many challenges with herbal drugs which need to be overcome

like difficulty of conducting clinical research in herbal drugs, development of simple bioassays for biological standardization, pharmacological and toxicological evaluation methods' development, investigation of their sites of absorption, toxic herbal drugs in use, discovering various animal models for toxicity and safety evaluation, legal and regulatory aspects of herbal drugs and so on.

Types of Novel Herbal Drug Delivery Systems

Several approaches in case of new herbal drug delivery system include different types of expressions such as mouth-dissolving tablets, oral dissolving films, liposomes, phytosomes, pharmacosomes, niosomes, nanoparticles, microspheres, transfersomes, ethosomes, transdermal drug delivery system (TDDS), and proniosomes.

Mouth-dissolving tablets

It induces a new drug delivery system that imparts increased efficacy. In the Ayurvedic medicine segment, this is the inaugural attempt to make medicines more effective in managing chronic ailments. Res-Q is a polyherbal medicine highly effective for lung problems and other respiratory ailments such as asthma.

This unique mouth-dissolving drug delivery system ensures that the drug reaches the blood right away and the first-pass metabolism is bypassed. It dissolves in mouth by mixing with the saliva and get absorbed.

Controlled-release formulations

An orally administrable formulation for the controlled release or stable storage of a granulated herb, comprising a granulated herb and a carrier, the formulation release of 75% of the active ingredients between 4 and 18 h after administration. The active elements are selected from the group consisting of hypericin, hyperforin, and echinacosides. The invention seeks to provide improved herbal preparations, whose preparations offer a convenient oral dosage form of herbs for supplying optimum plasma concentrations of the biologically active compounds that facilitates user compliance. The oral-controlled and stable-release dosage form of granulated herb is in either matrix formulations such as matrix tablets or in multiparticulate formulations such as microcapsules put into two-piece capsules that are performed in order to hold a drug delivery system, which will guarantee a regular supply of the active ingredients for a sustained period. Microgranules can be cleared up by a number of

different operations, for example, extrusion–spheronization, fluid–air bed process, or a cutting‐pan method. Extrusion–spheronization is suitable for pellets with high content of active meaning, but need more equipment. For the manufacture of the granules of the invention, the cutting‐pan method is preferred.

Liposomes

These are microparticulate or colloidal carriers, usually 0.05–5.0 μm in diameter which forms spontaneously when The liposomes are spherical particles that encapsulate a fraction of the solvent, in which they freely pass around or float into their interior. They can carry one, several, or multiple concentric membranes. Liposomes are constructed of polar lipids, which are characterized by having a lipophilic and hydrophilic group of the same molecules. On interaction with water, polar lipids self‐layup and form self‐organized colloidal particles.

The primary advantages of using liposomes include (i) the high biocompatibility, (ii) the easiness of preparation, (iii) the chemical versatility that allows the loading of hydrophilic, amphiphilic, and lipophilic compounds, and (iv) the simple modulation of their pharmacokinetic properties by varying the chemical composition of the components.

Phytosomes

Most of the bioactive constituents of phytomedicines are flavonoids, which are poorly bioavailable when taken orally. Water‐soluble phytoconstituent molecules (mainly polyphenols) can be converted into lipid‐compatible molecular complexes, which are called phytosomes. Phytosomes are more bioavailable as compared to simple herbal extracts owing to their enhanced mental ability to skip through the lipid‐rich biomembranes and finally arriving to the origin. The lipid‐phase substances employed to make phytoconstituents lipid compatible are phospholipids from soy, mainly phosphatidylcholine. Phytosomal complexes were first investigated for cosmetic applications, but mounting evidence of potential for drug delivery has been amassed over the past few years, with beneficial activity in the realms of cardiovascular, anti‐inflammatory, hepatoprotective, and anticancer applications. Phytosome complexes show better pharmacokinetics and therapeutic profile than their noncomplexed herbal extract. The phytosome technology has markedly enhanced the bioavailability of selected phytochemicals.

Nanoparticles

Nanoparticles are efficient delivery systems for the delivery of both hydrophilic and hydrophobic drugs. Nanoparticles are the submicron‐sized particles, ranging 10–1000 mm. The major goal behind designing nanoparticle as a delivery arrangement is to control particle size, surface properties, and release of pharmacologically active agents in order to achieve the site‐specific action of the drug at the therapeutically optimal rate and dose regimen. The nanospheres have a matrix type structure in which the active ingredient is dispersed throughout (the molecules), whereas the nanocapsules have a polymeric membrane and an active ingredient core.

Niosomes

Niosomes are multilamellar vesicles formed from nonionic surfactants of the alkyl or dialkylpolyglycerol ether class and cholesterol. Earlier studies in association with L'Oreal have shown that, in general, niosomes have properties as potential drug carriers similar to liposomes. Niosomes are different from liposomes in that they offer certain advantages over liposomes. Liposomes face problems such as they are expensive, their ingredients such as phospholipids are chemically unstable because of their predisposition to oxidative degradation, they require special memory and handling, and purity of natural phospholipids is variable. Niosomes do not have any of these problems.

Proniosomes

Proniosome gel system is step forward to niosome, which can be utilized for various applications in delivery of actives at desired site. Proniosomal gels are the formulations, which on *in situ* hydration with water from the skin are converted into niosomes. Proniosomes are water‐soluble carrier particles that are coated with surfactant and can be hydrated to form niosomal dispersion immediately before use on brief agitation in hot aqueous media.

Transdermal drug delivery system

TDDS has been an increased stake in the drug administration via the skin for both local therapeutic effects on diseased skin (topical delivery) as comfortably as for systemic delivery of drugs. However, they did not have had such expected success with other drugs. But, immense potential lies in transdermal drug as future smart drug delivery devices. Transdermal delivery system provides the advantage of controlled drug delivery, enhanced

bioavailability, reduction in side effects, and easy application. Ayurvedic drugs through TDDS, which utilizes skin as a site for continuous drug administration into the systemic circulation. Thus, this delivery system avoids the first‐pass metabolism of the drug without the annoyance associated with injection; moreover, the scheme offers a prolonged drug delivery with infrequent dosing via zero‐order kinetics and the therapy can be easily fired at any time.

Microspheres

Microspheres are discrete spherical particles ranging in average particle size from 1 to 50 μ. Microparticulate drug delivery systems are studied and taken on as a reliable one to rescue the drug to the target site with specificity, to assert the desired concentration at the situation of interest without untoward effects. Microencapsulation is a useful method which extends the duration of drug effect significantly and improves patient compliance. Finally, the entire dose and few adverse reactions may be thinned out since a steady plasma concentration is kept. Immune microsphere possesses the immune competence as a consequence of the antibody, and antigen was coated or adsorbed on the polymer microspheres.

Emulsions

Emulsion refers to a non homogeneous dispersion system that is composed of two kinds of liquids unable to dissolve each other, and one of which disperses in the other one in a form of droplets. The emulsion is composed of the oil phase, water phase, surfactant, and subsurfactant. Its appearance is translucent to transparent liquid. Emulsion can be split up into ordinary emulsion (0.1–100 μm), microemulsion (10–100 NM), sub‐micro‐emulsion (100–600 NM), etc. Among them, the microemulsion is also called nanoemulsions, and the sub‐micro‐emulsion is also called lipid emulsion. As a drug delivery system, emulsion gets distributed in vivo in the targeted areas due to its affinity towards lymphatic fluids. In addition, the drug can be a sustained release in a long time because the drug is packaged in the inner phase and kept off direct touch with the body and tissue fluid. Afterward, along the oily drugs or lipophilic drugs being made into O/W or O/W/O emulsion, the oil droplets are phagocytozed by the macrophage and get a high concentration in the liver, spleen, and kidney in which the quantity of the dissolved drug is truly heavy. While water‐soluble drug is produced into W/O or W/O/W emulsion, it can be well contracted in the lymphatic system by intramuscular or subcutaneous injection. The size of the emulsion particle has an impact on its target distribution. Aside from its targeted sustained release, producing the herbal drug

into emulsion will also beef up the stability of the hydrolyzed materials, improve the penetrability of drugs to the skin and mucous, and reduce the drugs' stimulus to the tissues.

Ethosomes

Newer advancements in the patch technology have led to the development of ethosomal patch, which consists of drug in ethosomes. Ethosomal systems are made up of soya phosphatidylcholine, ethanol and water. They may form multilamellar vesicles and have a high entrapment capacity for particles of various lipophilicities. The elastic vesicles and transfersomes have also been used as drug carriers for a range of small molecules, peptides, proteins and vaccines.

Ethosome has a high deformability and entrapment efficiency and can penetrate through the skin completely and improve drug delivery through the skin. Likened to other liposomes, the physical and chemical properties of ethosomes make the legal transfer of the drug through the stratum corneum into a deeper skin layer efficiently or even into the blood circulation. This property is very important as the topical drug carrier and transdermal delivery system. Moreover, the ethosomes carrier also can provide an efficient intracellular delivery for both hydrophilic and lipophilic drugs, percutaneous absorption of matrine an anti‑inflammatory herbal drug is increased, it also permits the antibacterial Peptide to penetrate into the fibrocyte easily.

Transfereosomes

Transfersomes are specially optimized particles or vesicles that can respond to an external stress by rapid and energetically inexpensive, shape transformations.[75] The development of novel approaches such as transfersomes have immensely contributed in overcoming problem faced by transdermal drug delivery such as unable to transport larger molecules, penetration through the stratum corneum is the rate limiting step, physicochemical properties of drugs hinder their own transport through skin. These elastic vesicles can squeeze themselves through skin pores many times smaller than their own size and can transport larger molecules. Transfersomes are applied in a nonoccluded method to the skin, which permeate through the stratum corneum lipid lamellar regions as a result of the hydration or osmotic force in the skin. It can be applicable as drug carriers for a orbit of small molecules, peptides, proteins and herbal elements. Transfersomes can penetrate the stratum corneum and supply the nutrients, locally to maintain its functions resulting maintenance of skin.

CONCLUSION

Herbal medications have been widely employed all over the globe since ancient times and have been acknowledged by doctors and patients for their better therapeutic value as they cause fewer adverse effects as compared with modern medications. The drugs of Ayurvedic origin can be utilized in a more upright course with enhanced efficacy by incorporating in modern dosage forms. However, phytotherapeutics need a scientific approach to render the components in a new way to increase patient compliance and avoid repeated administration.

This can be accomplished by designing NDDS for herbal ingredients. NDDS not only reduce the repeated administration to overcome noncompliance, but also help to increase the therapeutic value by reducing toxicity and increasing the bioavailability and so on. There is a wide growing market for novel formulations of herbal drugs with good therapeutic effect. There is a great potential in the development of novel herbal drug delivery system as these are safe, effective and people are regaining faith in herbal medicines as compared to modern medicine. Collaboration of modern technology with herbal drugs will led to enhanced bioavailability & improved solubility, reduced toxicity, controlled release delivery, effectiveness with dose reduction. The novel herbal drug delivery system will not only increase the market of herbal drugs but will also play a major role in providing better and effective therapy to humans.

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