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HERBOSOME A NOVEL APPROACH TOWARDS DRUG DELIVERY

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Abstract:

When it comes to improving human health, herbal therapies are always more beneficial than alternative allopathic medications. In this context, novel drug delivery methods will boost the bioavailability of phyto-pharmaceuticals, which are plant extracts complexed with phospholipid and a mixture of aprotic solvents. Compared to a straightforward herbal extract, phyto-phospholipid has a more advanced and accessible biological pathway that allows it to pass through membranes and enter the bloodstream. Using phyto-phospholipid, herbosome technology is one of the unique approaches to boost the bioavailability of phyto-pharmaceuticals. Formulation can be done in a lot of different ways, some of which are even patented. Silymarin, Ginkgo, Ginseng, Grape Seed, and Curcumin are among the medications that are still undergoing clinical testing and some that are available for purchase. Herbosomal formulations hold greater significance in the administration of targeted medications due to their enhanced bioavailability compared to normal formulations. Herbosomes are characterized in vitro by the examination of their microscopical characteristics, entrapment efficiency, percentage yield, zeta potential, particle size, surface texture analysis, and drug release profile. TEM, PCS, DSC, DLS, XRD, NMR, and FT-IR spectroscopy are a few of the instrumental techniques used. An effective barrier is provided by the diffusion-mediated drug release from the vesicle-structured herbosome, which also enables the design of topical and oral drug delivery systems for systemic impact. The results of previous studies and our personal discoveries about phyto-phospholipid complexes with additional components are highlighted in the current work.

Keywords: *Herbosomes, Phospholipid, Bioavailability, Phytomedicine, Bio-membrane penetration.*

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INTRODUCTION:

Traditional phytomedicines have long been used for medicinal purposes and are now widely used to effectively treat human disease. The goal of the most recent developments in herbal medicine technology is to increase the bioavailability of polar bio-active ingredients including flavonoids, glycosides, and phenolic acids. A novel paradigm called the herbosome has been effectively designed to target a strong pharmacological response while maintaining a balanced level of nutritional safety and achieving amazing bioavailability of herbal drugs. “Some" denotes something that resembles a cell, while "Herbo" refers to a plant. Phospholipids are used to entrap standardized plant extracts or polar bioactive phytoconstituents to create herbosomes, a suitable macromolecular complex. The stoichiometric amount of phospholipids and the herbal component interact in an aprotic solvent to produce these complexes. Phenocologically active phytoconstituents encased in natural or synthetic phospholipids such as phosphatidylcholine, phosphatidylserine, and phosphatidylethanolamine form the basis of herbosome structures, which range in size from 50 nm to a few hundred µm.It is discovered that the lipophilic herbosomes have a distinct melting point and are highly and moderately soluble in fats and non-polar solvents, respectively. Herbosomes are thought to be water-treated micelles with a structure similar to liposomal structure, but they are fundamentally different.Herbosomes have many benefits, including ease of manufacture, improved stability, longer therapeutic effect, potential for biomembrane penetration, and enhanced bioavailability; however, their short half-life, risk of phospholipid-induced degradation, and high production costs restrict herbosome research[1].

STRUCTURE OF HERBOSOME:

The herbosome contains the words "some" and "a herbo." The bioactive element of the plant-derived herbosome complex is referred to as "herbo". Some describe the ultimate form of the complex as having properties similar to those of cell membranes. Studies have demonstrated the compatibility of hydrophilic and lipophilic media with herbosome complexes. From a chemical perspective, they function as a vehicle for the delivery of phyto-lipids. Herbosome synthesis uses nonpolar solvents, which phospholipids and polyphenols interact well in. The foundation for the synthesis of herbosomes is provided by hydrogen bonds (Hbonds), which are the main interaction between the bioactive material found in herbosomal structures and the polar portions of phospholipids, or phosphate groups. It was claimed that the main interaction taking place in catechin-loaded Herbosomes was the formation of H-bonds between the hydroxyl portion of the catechin and the phosphate group of the phosphatidylcholines.Herbosomes typically resemble liposomes in structure when exposed to water[2]

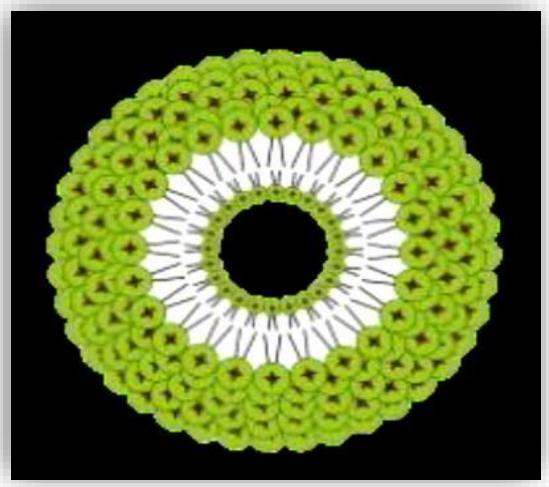

Fig.1 Structure of Herbosome

THE PRINCIPLE OF HERBOSOME TECHNOLOGY:

They are supplied for the direct complex with phosphatidylcholine by the extracts of the flavonoid and terpenoid phytochemical constituents. Herbosomes are produced when standardized extract or polyphenolic components in a non-polar solvent react with a stoichiometric amount of phospholipid (phosphatidylcholine). The compound phosphatidylcholine has two functions: the choline moiety is hydrophilic in nature, while the phosphatidyl moiety is lipophilic. Specifically, the lipid-soluble phosphatidyl portion of the phosphatidylcholine molecule, which consists of the body and tail, envelops the choline-bound material, is what binds to these compounds. As a result, the phytoconstituents and phospholipids combine to form a lipid-compatible molecular complex known as the phytophospholipid complex. through particular spectroscopic methods[3].

PROPERTIES OF HERBOSOME

1) Chemical properties

These complexes are produced when phospholipids and herbal extracts or molecules react in a stoichiometric ratio of 1:1 or 2:1. The stability of the herbosome is increased by hydrogen bonds that form between the polar heads of phospholipids (PO4 & NH3) and the polar section of the substrate.Herbosomes have a medium solubility in

lipids and are soluble in non-polar liquids ("Phyto-lipid delivery technique"). They adopt a liposomial-like structure known as the micellar form8 when they come into contact with a polar solvent such as water[4].

2) Physical properties

The size of the herbosome vesicle after the phyto-phospholipid complex forms can be determined using transmission electron microscopy or photon correlation spectroscopy. Its range is between 50 nm and several hundred nm. Herbosomes have a spherical shape, rough surface morphology, and strong flowability, as seen by their surface features. Particle size is important when administering medications transdermally. Because of the formulation's high lipid content, agglomerates formed more readily, producing larger particles[5].

3) Pharmacological properties

Pharmacokinetic and pharmacodynamic studies in humans and experimental animals have demonstrated the biological behavior of herbosomes, including improved absorption and utilisation that results in better bioavailability. Dihydro-myricetin herbosomes exhibit an enhanced pharmacokinetic profile, characterized by increased bioavailability as a result of elevated Cmax and AUC values, as well as decreased clearance rate and volume of distribution[6].

MERITS AND DEMERITS OF HERBOSOMES:

1) Merits of herbosomes-

1)Herbosomes show better stability as the chemical bond is formed between phospholipid molecule and phytoconstituent.

2)Dose of phytoconstituents is reduced due to more bioavailability of phytoconstituents in the complex form.

3)Duration of action is increased and also Herbosomes are simple to manufacture.

4)Phytoconstituents complex with phospholipids are more stable in gastric secretion and resist the action of gut bacteria.

5) Herbosome formulation technique enhanced the permeability of phyto-constituents across the biological membranes[7].

2) Demerits of herbosomes-

1)There are also some few demerits in an herbosome formulation as the phytoconstituents of herbosome are rapidly eliminated.

2)Herbosomes shows short half-life. Hydrolysis, fusion, leakage and oxidation is undergone by the phospholipids.

3) It has a high cost of production and sometimes the occurrence of allergic reactions to the herbosomal constituents may be observed. Because of their larger size problems can occur while trying to target to the various tissues[8].

Advantages of herbosomes over Conventional Drug Delivery System:

• It improves the absorption of lipid-insoluble polar phytoconstituents via oral and topical administration, demonstrating improved bioavailability and thus a fundamentally more prominent remedial advantage.

• Increased bioavailability due to phospholipid complex.

• Because high lipophilicity leads to high penetrability, it is used in beauty care products instead of liposomes.

• Herbosomes have been used to deliver liver-protecting flavonoid because this technology makes them easily bioavailable.

• The herbosomal system is non-invasive and passive, making it suitable for immediate commercialization. Because of improved absorption of the main constituent, the dose requirement is reduced.

• Because chemical bonds are formed between the phosphatidylcholine atom and the phytoconstituent of the herb, herbosomes have a higher stability profile.

• The required dose is reduced.

• Improved entrapment efficiency

• Herbosomes ensured drug delivery to the tissue; and

• Herbosomes outperformed liposomes in skin care products.

• Due to the low solubility of herbosomes in aqueous media, stable emulsions and creams can be formed[9].

Comparison between liposome and herbosomes:

Similar to herbosomes, phosphatidylcholine and a water-soluble material are combined in a precise ratio and under particular circumstances to form liposomes. The water soluble material is surrounded by phosphatidylcholine molecules in this instance; no chemical bond is formed. The water-soluble compound might be surrounded by hundreds or even thousands of phosphatidylcholine molecules. On the other hand, depending on the substance(s) complexed, the phosphatidylcholine and the plant components actually form a 1:1 or a 2:1 molecular complex during the herbosome process, involving chemical bonds (hydrogen bonds). Herbosomes exhibit superior absorption compared to liposomes due to this disparity in bioavailability[10]. The hydrophilic principle and the surrounding lipid core of liposomes interact little to none at all. The active principles of liposomes are water soluble and housed in the inner cavity. On the other hand, herbosomes host their polyphenolic guest, which is typically only weakly soluble in lipids and water, at their surface where the polar functionalities of the lipophilic guest interact with the charged phosphate head of phospholipids through polar interactions and hydrogen bonds, forming a unique arrangement that is demonstrable through spectroscopy[11].

CONSTITUENTS OF HERBOSOMES:

1) Phospholipids

A hydrophilic head (polar) group and hydrophobic (non-polar) acyl chains are joined to the alcohol to form phospholipid molecules. Many different types of lipids exist because of variations in polar groups, aliphatic chains, and alcohols. Lipids with phosphorus, both polar and non-polar phosphorus ions in their structures are called phospholipids. Phospholipids have the potential to minimize changes in plasma profile data and increase the bioavailability of active ingredients in herbal medicines; however, characterization of suitable lipid excipients for physiological requirements is a necessary first step. Systems for Delivering Drugs According to the Planned Use Commercial addresses all significant topics, including the transfer of technology and problems with manufacturing on a commercial scale from laboratory settings. In addition, PC is an essential component of cell membranes, which explains its strong biocompatibility and low toxicity. Hepatoprotective properties are exhibited by phosphatidylcholine molecules, which have also been observed to have therapeutic benefits in the management of liver disorders, including hepatitis, hepatocirrhosis, and liver disease. High-affinity small molecule phospholipid complexes of siramesine and phosphatidic acid (PA) were synthesized by Patel et al[12].

2) Phyto-active constituents

Researchers typically choose phyto-active constituents not so much for their in vivo activities as for their notable in vitro pharmacological effects. Most of these compounds are flavonoids. Water-soluble flavonoids, such as quercetin, cathechin, and silibinin, are found in plants and prefer the aqueous phase where they cannot pass through biological membranes. As lipophilic flavonoids, rutin and curcumin won't dissolve in aqueous gastrointestinal fluids. Herbosome complexes improve the water solubility and membrane penetrability of hydrophilic and lipophilic flavonoids, respectively, in the aqueous phase. Additionally, by forming complexes, flavonoids can be shielded from external effects like hydrolysis, photolysis, and oxidation[13].

3) Solvents

Various solvents have been used as the reaction medium by several researchers to form herbosome complexes. Protonic solvents such as ethanol have largely replaced the aromatic hydrocarbons, halogen derivatives, methylene chloride, ethyl acetate, and cyclic ethers that were previously used to create phytophospholipid complexes. In fact, phospholipid complexes have been successfully formed recently using protonic solvents like ethanol and methanol. Growing popularity as a potential technique for producing micronic and submicronic particles with regulated sizes and size distributions is one of the SCF technologies. To lessen the solute's solubility in the solvent, an anti-solvent (often CO2) is used at supercritical temperatures[14].

Table 1: Examples of Some Solvent used in Preparationof Herbosomes.

Sr. no.	Solvent	Boiling Point 0C	Melting Point 0C
1	Ethanol	78.5	-117
2	Chloroform	62	-63
3	Tetrahydrofuran	65	-108
4	DMSO	190	19

4) Stoichiometric ratio of active constituents and phospholipids

Generally, different techniques were used to prepare a test batch of plant extract and phospholipid herbosome complex in a 1:1 molar ratio. conducted a comparative analysis using the stoichiometric ratios of 1:1, 1.4:1, 2:1, 2.6:1, and 3:1 to create oxymatrine-phospholipid complexes. It was found that the ratio of 3:1 produced the best results. Thus, a 1:1 stoichiometric ratio is not always suitable for the formulation of phospholipid complexes. For different kinds of drugs, we can experimentally change the stoichiometric ratio of phospholipids and bioactive ingredients in accordance with distinct uses, like the maximum drug loading[15].

5) pH maintenance

Buffering agent is used to keep the preparation's pH constant. Saline phosphate buffer (7 percent v/v) and ethanol tris buffer (pH 6.5) are two commonly used buffering agents. Buffer is used to maintain the herbosomes' hydration[16].

Methods of Herbosomes Preparation:

1) Anti-solvent precipitation technique

In a 100 mL round-bottom flask, the fixed amount of phospholipid mixed with the herb extract is a suitable ratio. Reflux with 20 mL of dichloromethane for two hours (at a temperature below 60°C). Reduce the mixture's volume to 5–10 mL. Carefully add the dissolving agent while stirring continuously. Filter and collect the precipitate, then store it in a desiccator for the entire night. Once the precipitate is dried, crush it in a mortar[17].

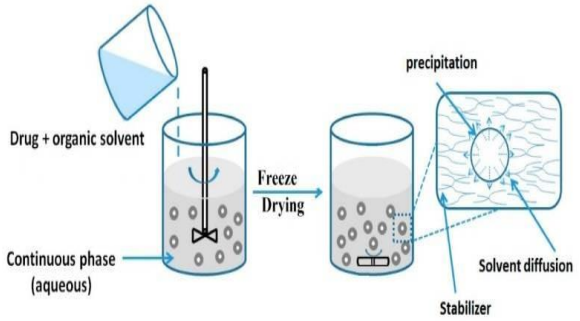

Fig2. Anti-solvent precipitation technique.

2) Rotary Evaporation technique

A precise amount of phospholipid and herb extract were combined and dissolved in 30 milliliters of tetrahydrofuran at a temperature below 40 degrees Celsius. The mixture was then continuously stirred, and n-Hexane was added to a thin layer of the sample. The precipitate was then collected and stored in a light-resistant glass bottle with an amber color, at a temperature not to exceed 25 degrees Celsius[18].

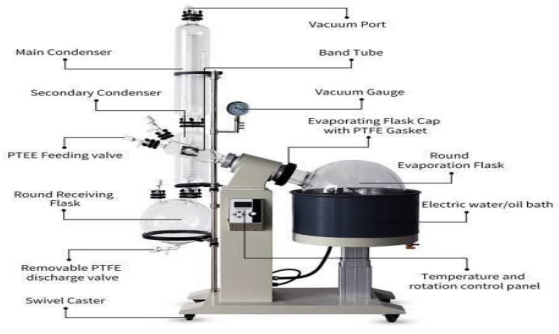

Fig. 3:

3) Solvent evaporation technique

The prescribed amount of phospholipid-infused herbal extract was combined in a 100 mL round-bottom flask and refluxed for two hours at 50–60 °C with 20 mL of acetone; Concentrate the mixture to 5–10 mL; strain and gather the precipitate; store the complex in an amber-colored glass bottle at 25 °C[19].

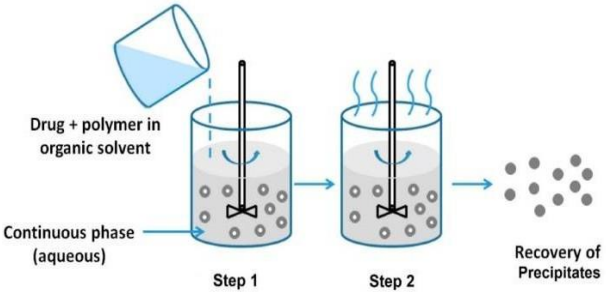

Fig.4.Solvent evaporation technique

4) Ether-injection technique

The drug-lipid complex should be dissolved in an organic solvent. Gradually inject this blend into a heated aqueous medium. creation of vesicles with distinct structures that are amphiphilic.

5) Sonication technique

The proper quantity of cholesterol and phospholipid should be added to a flask with a flat bottom and dissolved in 10 milliliters of chloroform. The mixture should then be sonicated in a bath sonicator with a rotating evaporator at 40°C white under reduced pressure to eliminate organic solvents. The medication's polyphenolic extract is hydrated into a layer in a rotary evaporator following the complete removal of the thin solvent. The amber-colored container was used to sonicate the phospholipid mixture[20].

NOVEL METHODS:

The intricacies of the extraction process, the number of steps involved, and the duration of traditional methods are among their shortcomings. Materials of interest can have their morphology, size, and shape altered using supercritical fluid techniques. High product purity, control over crystal polymorphism, the ability to process thermolabile materials, a one-step procedure, and environmentally friendly technology are additional advantages. While rapid expansion of supercritical solutions (RESS) uses a supercritical fluid (usually CO2) as a solvent, gas anti-solvents technique (GAS), supercritical antisolvent technique (SAS), and solution enhanced dispersion by supercritical fluids (SEDS) techniques use it as an anti-solvent to limit the solute's solubility in the solvent.

1) Gas anti-solvents technique (GAS):

The use of supercritical CO2 gas as an antisolvent is not necessary. To achieve uniform mixing, it is injected into the solution in a closed chamber, preferably from the bottom. Solutes precipitate because of the decreased solubilization power of the organic solvent brought on by the dissolution of CO2 gas. To get rid of any remaining solvent, the particles are rinsed with more antisolvent. If not, the solutes might resolubilize during the depressurization step, endangering the stability of the product. When scaled up to industrial levels, the gas antisolvent technique outperforms the solvent antisolvent technique in terms of results.

2) Supercritical antisolvent precipitation (SAS):

The solvent is removed from the gas phase by decreasing the pressure in the SAS, producing submicrometer-sized particles with a narrow size distribution. The supercritical condition of CO2 is a

requirement. Both the solution and the CO2 are pumped from the top into a closed chamber. This approach has been shown to be effective on a large scale, in contrast to GAS30[21].

DIFFERENT ADDITIVES USED IN HERBOSOME FORMULATION:

Lipids: Phospholipid like Soya phosphatidylcholine, Egg phosphatidylcholine, Dipalmitoyl phosphatidylcholine, Distearyl phosphatidylcholine[31]. Utilised as a vesicle-creating element.

Solvent:

Aprotic Solvent: Dioxane, acetone, methylene chloride. Used as a solvent.

Non-solvent: n-hexane and non- solvent i.e. aliphatic hydrocarbon. used as a solvent for complicated precipitations.

Alcohol: Methanol and ethanol As a solvent, use

Buffering agent: Saline phosphate buffer (pH 6.5) 7 % v/vEthanol Tris buffer ((pH 6.5). used as a hydrating agent[22].

MECHANISM OF WORKING:

Amphipathic in nature, phospholipids contain both polar and non-polar regions. Their polar ends are made up of phosphate or amine groups that form weak hydrogen bonds with the polar groups of the substrate. The remaining non-polar phospholipid chain then warps over the resulting complex, giving it a lipophilic quality. It can now readily cross the lipophilic enterocyte membrane, and the botanical derivative's passage through the GIT barrier (as a complex with phospholipid) is made easier (water phase > enterocyte > systemic circulation)[23].

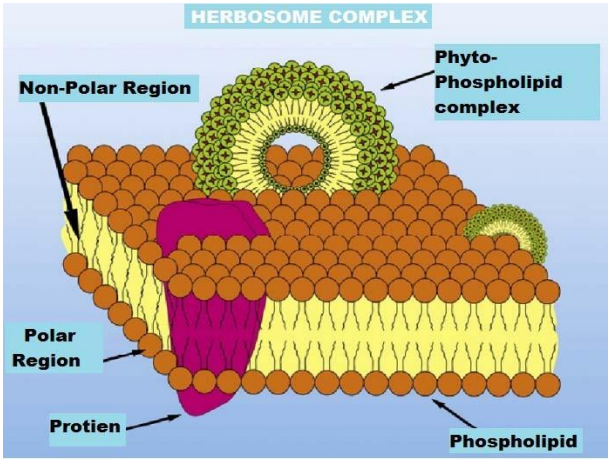

Fig. 5: Mechanism of herbosome loaded complex

Characterization of Herbosome Complexes

Their characterization is based on physical characteristics like shape, size, distribution, ability to entrap drugs, drug release, and chemical composition. Infrared Spectroscopy, Nuclear Magnetic Resonance (NMR) Spectroscopy, Differential Scan Calorimetry, Transmission Electron Microscopy (TEM), Photon correlation Spectroscopy (PCS), Percentage drug entrapment[24], Solubility study, etc. are some of the techniques used to characterize them34.

1) Particle Size and Zeta Potential. Zeta potential and particle size are significant characteristics linked to the stability and repeatability of complexes. Phospholipid complexes typically had an average particle size between 50 nm and 100 µm.

2) Scanning Electron Microscopy (SEM). After the herbosome is coated with gold, the Scanning Electron Microscopy (SEM) produces a photomicrograph of it at the proper magnification. Studies of surface morphology are frequently crucial for determining surface characteristics, trapping behavior, and the existence or lack of impurities.

3) Transmission Electron Microscopy (TEM). For material science, the transmission electron microscope is an invaluable instrument. An extremely thin sample is exposed to a high energy electron beam, and features like the grain boundary and dislocations can be seen by using the interactions between electrons and atoms to observe the structure[25].

4) Differential scanning calorimetry (DSC). Differential scanning calorimetry (DSC) is the most widely used thermal analysis method and the "workhorse" of thermal analysis. Although the technique is relatively new, its name dates back to 1963 when Perkin-Elmer released the DSC-1, the original DSC, for commercial use. The term DSC refers to the ability to obtain quantitative calorimetric data on the sample during a linear temperature ramp.

5) Nuclear Magnetic Resonance (NMR): The identification of complex structures is aided by the use of the 1H and 13C NMR methods. As was previously mentioned, interactions between polyphenols and phospholipids are caused by hydrogen bonds rather than chemical bonds[26].

1) 1HNMR: In nonpolar solvents, the 1H-NMR signal from the atoms that made up the complex is significantly altered without any summation of the signal specific to each individual molecule. The indications that the flavonoid protons cannot be relieved should be expanded to include the proton.

2) 13CNMR: All of the flavonoid carbons are visibly absent in the 13C-NMR spectra of (+)-catechin and its

stoichiometric complex with distearoyl phosphatidylcholine, especially when recorded at room temperature in C6D6. The signals associated with the lipid fraction of glycerol and choline (60-80 ppm) are both broadened and partially shifted, while the resonances of the majority of fatty acid chains retain their original sharp line shape[27].

6) Fourier transform infrared spectroscopy (FTIR): The complex's formation will be verified by infrared (IR) spectroscopy, which compares the complex's spectrum to that of its constituent parts and their mechanical mixtures. Additionally helpful for regulating the stability of herbosomes when microdispersed in water or added to a very basic cosmetic gel is FTIR spectroscopy.

7) X-ray diffraction (XRD): The structure of crystalline materials, including atomic arrangement, crystalline size, and imperfections, can be examined using XRD analysis. Findings obtained with a graphite monochrome Phillips X-Ray diffractometer (Model 1130/90) at a count rate of 103. Currently, X-ray diffraction is a useful technique for studying the microstructure of some amorphous materials as well as crystalline forms[28].

8) Entrapment Efficiency: One can compute the entrapment efficiency of nanocarriers directly or indirectly. The free or unrestricted amount was estimated using the indirect method by looking at the supernatant following centrifugation. Equation was used to determine incorporation efficiency as a percentage of drug content[29].

Incorporation efficiency = Amount of drug in nanocarriers / Initial amount of drug *100

The total yield of the extracts was therefore calculated and the EE was determined by the following formula:

EE (%) = amount of extract in complex/total amount of extract taken*100

9) Solubility study: At a specific temperature, the solubility of drug-loaded nanocarriers has been estimated in a range of polarity solvents, and the amount of drug that has been dissolved has been measured using the appropriate analytical technique at the maximum absorption observed. Improved bioavailability and a decrease in cellular melanogenesis activity were the outcomes of increased solubility[30].

APPLICATION OF HERBOSOME

1) Nervous system

Research has demonstrated that herbosomes are more effective than traditional standardized extracts at treating the nervous system. As the scopolamine-induced amnesia test has been widely accepted as a primary screening test for anti-alzheimer drugs, one study's study in mice clearly indicates its memory-enhancing characteristics and supports its therapeutic usage in Alzheimer's illness[31].

2) Cardiovascular system

.Numerous studies on grape seed herbosomes have shown increased total antioxidant capacity, stimulation of plasma's physiological defenses, protection against heart damage induced by ischemia/reperfusion, and protective effects against atherosclerosis, which provides significant cardiovascular system protection.Research has demonstrated that ginkgo herbosome is more effective than traditional standardized extract at preventing ischemia in rat isolated hearts[32].

3) Inflammation

Numerous studies have shown that herbosomes have superior anti-inflammatory properties than pure herbal extracts. According to a study on rutin herbosome skin absorption, rutin herbosomes can pass through the extremely impermeable stratum corneum more easily than free rutin.In a different study, lawsone herbosome gel therapy significantly reduced inflammation in rat paw oedema induced by carrageenan at four hours when compared to plant lawson gel.

4) Oxidative stress

Research has indicated that herbosomes exhibit superior anti-hepatotoxic properties in comparison to standardized plant-based herbal extracts.In a different investigation, CCL4 was utilized to cause hepatotoxicity by causing parenchymal cell degradation and adipose tissue damage in comparison to the control group.There are two primary causes for this: 1) Because of phospholipid-based molecular aggregates, higher aqueous phase solubility increases intestinal absorption; 2) Phospholipids shield apigenin from hepatic first-pass metabolism.

5) Diabetes

Herbosomes formulated from the plant Momordica dioica, at a lower dose, demonstrated a more significant lowering effect on blood glucose in a study on rats with streptozotocin-nicotinamide-induced diabetes. This effect was comparable to that of the standard group receiving the anti-diabetic medication metformin.

6) Cancer
When compared to regular plant extract, several researchers found that the formulation of herbosomes had a stronger anti-tumor effect. Herbosomes with a molecular weight greater than 40 kDa and a nanometric size range of 100–1200 nm actively target tumor cells due to their improved penetration and retention impact, according to a study on herbosome tumor therapy.

7) Obesity
In a study, soy herbosomal thermogel applied topically to rats showed a reduction in the serum lipid profile and a local anti-obesity effect on the abdomen of the rats.
fungus-related illness It has been reported that the anti-fungal activity of herbosomal complexes is higher than that of simple plant-based herbal extract. As evidenced by the maximum zone of inhibition, the herbosome complex of lawsone exhibited superior antifungal activity in comparison to both the plant medicine lawsone and plain ketoconazole.

Pharmaceutical Approach of Herbosomal Technology
The stoichiometric reaction of the phospholipids (phosphatidylcholine, phosphatidylserine, etc.) produces the cell-like structures known as herbosomes. In comparison to traditional herbal extracts, the standardized extract or polyphenolic constituents in a nonpolar solvent yield superior results because they are better absorbed and shield the active ingredients from being destroyed by gut bacteria and digestive secretions. Therefore, for good therapeutic activity, fewer amounts of standardized herbal extracts or phytoconstituents administered in the body through multiple routes are needed thanks to herbosomal preparations[33].

Herbosome Formulations Development
Herbosome complexes can be processed and produced by pharmaceutical companies into a variety of dosage forms that can be applied topically or taken orally. To take full advantage of this technological advance, a range of products can be developed with improved bioavailability and formulation manageability.

1) Capsules
crystalline gelatin capsules It is also possible to create harder-to-swallow gelatin capsules using the herbosome complex. Although the obvious low density of the herbosome complex tends to limit the total amount of powder that can be filled into a capsule (typically not more than 300 mg for a size 0 capsule), it is still possible to use a direct volumetric filling procedure (without pre-compression).

2) Soft gelatin capsules
It is also possible to create harder-to-swallow gelatin capsules using the herbosome complex. Although the herbosome complex's evident low density tends to limit the total amount of powder that can be filled into a capsule (typically not more than 300 mg for a size 0 capsule), it is still possible to use a direct volumetric filling procedure (without pre-compression).In this instance, the best production method is determined by first performing a dry granulation process[34].

3) Tablets
Dry granulation is the safest method available for producing tablets with larger unitary dosages and adequate technical and biological characteristics. It's crucial to remember that in order to optimize the herbosome complex's technical qualities and produce tablets with appropriate morphology when using a direct compression process, it should be diluted with 60–70 percent excipients. However, due to the detrimental effects that heat and water (granulation/drying) have on the stability of phospholipid complexes, wet granulation ought to be avoided[35].

4) Topical product
Furthermore, topically applying the herbosome complex is an option. To integrate the herbosome complex into the emulsion, a phospholipidic complex needs to be applied to an emulsion that has been previously prepared at low temperatures (less than 40°C) and distributed in a small volume of the lipidic phase.

CONCLUSION:

Herbosomes represent a sophisticated herbal extract form that exhibits superior absorption compared to traditional herbal extract. Thus, the benefits, morphological traits, chemical composition, and preparation process of herbosomes are reviewed in this article. The formulation of herbosomes has several therapeutic benefits, including hepatoprotective, anti-inflammatory, antioxidant, and anticancer properties. Herbosome formulations offer improved solubility, stability, long-term dosing, resistance to chemical and physical degradation, and pharmacological efficiency over conventional herbal formulations. .. A higher concentration of active drug is now available at the Herbosome site of action. Many powerful phytocomponents with enhanced bioavailability are presently offered for sale as herbosomes. It is well known that phospholipid complexes can be evaluated

and their structural validity confirmed. Phospholipids can significantly increase bioavailability when compared to chemically equivalent non-complex forms. With the help of scientists and clinicians, phytophospholipid complexes have a bright future in pharmaceutical applications.

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Disclosure of conflict of interest

The authors have no conflict of interest to declare.

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