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Review Article

# HERBOSOME-A NOVEL CARRIER FOR HERBAL DRUG DELIVERY

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**ABSTRACT**

The effectiveness of any herbal medication is dependant on the delivery of effective level of the therapeutically active compound. Severe limitation exists in their bioavailability when administered orally or topically. Herbosomes are recently introduced herbal formulations that arebetter absorbed and as a result produce better bioavailability and actions than the conventional phyto molecules or botanical extracts. In the recent days, most of the prevailing diseases and nutritional disorders are treated with natural medicines. Several plant extracts and phytoconstituents, despite having excellent bioactivity in vitro demonstrate less or no in vivo actions due to their poor lipid solubility or improper molecular size or both, resulting in poor absorption and bioavailability. So, much work has been directed towards the development of new concept in herbal delivery system i.e., "herbosomes" which are better absorbed, utilized and as a result produce better results than conventional herbal extracts owing to the presence of phosphatidylcholine which likely pushes the phytoconstituent through the intestinal epithelial cell outer membrane, subsequently accessing the bloodstream. Herbosomes have improved pharmacokinetic and pharmacological parameter which in result can advantageously be used in the treatment of the acute and chronic liver disease of toxic metabolic or infective origin or of degenerative nature. It can also be used in anti-inflammatory activity as well as in pharmaceutical and cosmetic compositions.

**Keywords:** Herbosomes, Phytosomes, Phosphatidylcholine, Flavonoids, Bioavailability

## INTRODUCTION

The term "herbo" means plant, while "some" means cell-like. Over the past century; phytochemical and phyto-pharmacological sciences established the compositions, biological activities and health promoting benefits of numerous botanical products. Most of the biologically active constituents of plants are polar or water soluble molecules. However, water soluble phytoconstituents (like flavonoids, tannins, glycosidic aglycones etc) are poorly absorbed either due to their large moleculer size which cannot absorb by passive diffusion, or due to their poor lipid solubility; severely limiting their ability to pass across the lipid-rich biological membranes, resulting poor bioavailability [1] Phytomedicines, complex chemical mixtures prepared from plants, have been used for health maintenance since ancient times. But many phytomedicines are limited in their effectiveness because they are poorly absorbed when taken by mouth. The Phytosome® technology, developed by Indena S.p.A. of Italy, markedly enhances the bioavailability of select phytomedicines, by incorporating phospholipids into standardized extracts and so vastly improve their absorption and utilization[2]. Over the past century, chemical and pharmacologic science established the compositions, biological activities and health giving benefits of numerous plant extracts. But often when individual components were separated from the whole there was loss of activity—the natural ingredient synergy became lost[3]. Standardization was developed to solve this problem. As standardized extracts became established, poor bioavailability often limited their clinical utility. Then it was discovered that complexation with certain other clinically useful nutrients substantially improved the bioavailability of such extracts. The nutrients so helpful for enhancing the absorption of other nutrients are the phospholipids. Phospholipids are complex molecules that are used in all known life forms to make cell membranes. They are cell membrane building blocks, making up the matrix into which fit a large variety of proteins that are enzymes, transport proteins, receptors, and other biological energy converters. In humans and other higher animals the phospholipids are also employed as natural digestive aids and as carriers for both fat-miscible and water miscible nutrients.[2,4] Increased bioavailability of the Herbosomes over the simpler, non complex plant extracts has been demonstrated by pharmacokinetic (tissue distribution) and activity studies, conducted in animals as well as in humans. Herbosome has an added dimension: the proven health giving activity of the phospholipids themselves. Herbosomes is also often known as **phytosomes**. Herbosomes exhibit better pharmacokinetic and pharmacodynamic profile than conventional herbal extracts. molecular layer consisting of PC and other phospholipids provides a continuous matrix into which the proteins insert.

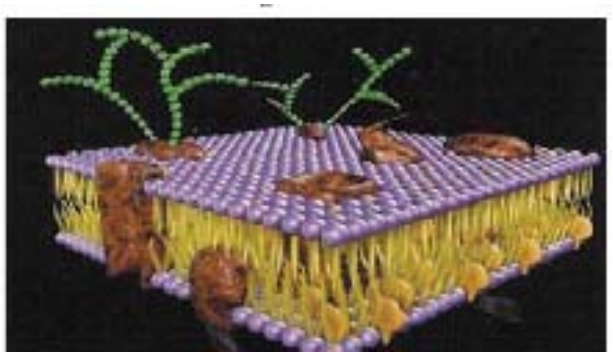

**Fig. 1: Cell membranes are largely lipid - phase. A double**

### History of herbosomes

The herbosome process is a small cell in itself, as the valuable components of the herbal extract are protected from destruction by the digestive secretions and gut bacteria. Water-soluble phytoconstituents can be converted into lipid-compatible molecular complexes and therefore are aptly called herbosomes. The lipid-phase substances employed to make phytoconstituents lipid compatible are phospholipids from soy, mainly phosphatidylcholine (PC). PC is the principal molecular building block of the cell membranes, miscible both in water and in oil environments, and is well absorbed when taken orally. Chemical analysis indicates that herbosome is usually a phytoconstituent molecule linked with at least one PC molecule. PC is not merely a passive "carrier" for the bioactive phytoconstituent of the herbosomes but is itself a bioactive nutrient with documented clinical efficacy for liver disease, including alcoholic hepatic steatosis, drug-induced liver damage, and hepatitis.[5]

The intakes of a herbosome preparation are sufficient to provide reliable clinical benefit, often leading to provide substantial PC intakes. The herbosome process has been applied to many popular

herbal extracts, including *Milk thistle, Ginkgo biloba, Grape seed, Green tea, Hawthorn, Ginseng* etc. The phytoconstituents lend themselves quite well for the direct binding to PC, which means that the choline head binds to phytoconstituents while the fat-soluble phosphatidyl portion comprising the body and tail then envelopes the choline-bound material. This result is a little microsphere or cell being produced. [5,6]

**RELATED TERMS WITH "SOMES"**

The "Somes" the cell like formulations of novel drug delivery system. There are different types of somes like

- Liposomes, which encapsulate water and lipid-soluble pharmacologically and cosmetically active components.
- Herbosomes are standardized extracts or purified fractions complexed with phospholipids for a better bioavailability and enhanced activities.
- Cubosomes are bicontinuous cubic phases, consisting of two separate, continuous, but nonintersecting hydrophilic regions divided by a lipid layer that is contorted into a periodic minimal surface with zero average curvature.
- Colloidosomes are solid microcapsules formed by the self-assembly of colloidal particles at the interface of emulsion droplets. "Colloidosomes," are hollow, elastic shells whose permeability and elasticity can be precisely controlled.
- Ethosomes are noninvasive delivery carriers that enable drugs to reach the deep skin layers and/or the systemic circulation. Ethosomes contain phospholipids, alcohol (ethanol and isopropyl alcohol) in relatively high concentration and water.
- Aquasomes - these are spherical 60300nm particles used for drug and antigen delivery. The particle core is composed of noncrystalline calcium phosphate or ceramic diamond, and is covered by a polyhydroxyl oligomeric film.
- Pharmacosomes are the colloidal dispersions of drugs covalently bound to lipids and may exist as ultrafine vesicular, micellar, or hexagonal aggregates, depending on the chemical structure of the drug–lipid complex.
- Niosomes are non- ionic surfactant vesicles and, as liposomes, are bilayered structures. etc.

**View on herbosome technology**

The flavonoid constituents of plant extracts lend themselves quite well for the direct binding to phosphatidylcholine. Herbosomes results from the reaction of a stoichiometric amount of the phospholipid (phosphatidylcholine) with the standardized extract or polyphenolic constituents (like simple flavonoids) in an aprotic solvent. [7] Phosphatidylcholine is a bifunctional compound, the phosphatidyl moiety being lipophilic and the choline moiety being hydrophilic in nature. Specifically the choline head of the phosphatidylcholine molecule binds to these compounds while the lipid soluble phosphatidyl portion comprising the body and tail which then envelopes the choline bound material.

**Fig. 2: Organization of the herbosome molecular complex. A flavonoid molecule (lower right) is enveloped by a phospholipid molecule.**

Hence, the phytomolecules produce a lipid soluble molecular complex with phospholipids, also called as phyto-phospholipid complex. Molecules are anchored through chemical bonds to the polar choline head of the phospholipids, as can be demonstrated by specific spectroscopic techniques.[8,9] Precise chemical analysis indicates the unit herbosome is usually a flavonoid molecule linked with at least one phosphatidylcholine molecule. The result is a little micro sphere or cell is produced. The term "phyto" means plant while "some" means cell-like. The herbosome technology produces a little cell, whereby the plant extract or its active constituent is protected from destruction by gastric secretions and gut bacteria owing to the gastroprotective property of phosphatidylcholine.[10]

**Comparison between liposome and herbosomes**

Likewise herbosomes, a liposome is formed by mixing a water soluble substance with phosphatidylcholine in definite ratio under specific conditions. Here, no chemical bond is formed; the phosphatidylcholine molecules surround the water soluble substance. There may be hundreds or even thousands of phosphatidylcholine molecules surrounding the water-soluble compound. In contrast, with the herbosome process the phosphatidylcholine and the plant components actually form a 1:1 or a 2:1 molecular complex depending on the substance(s) complexed, involving chemical bonds (hydrogen bonds). This difference results in herbosome being much better absorbed than liposomes showing better bioavailability. Herbosomes have also been found superior to liposomes in topical and skin care (cosmetic) products.[11]

Herbosomes are not liposomes - structurally, the two are distinctly different as shown in Fig. The herbosome is a unit of a few molecules bonded together, while the liposome is an aggregate of many phospholipid molecules that can enclose other phytoactive molecules but without specifically bonding to them.[12,13] This difference results in herbosome being much better absorbed than liposomes showing better bioavailability. Herbosomes have also been found superior to liposomes in topical and skin care (cosmetic) products.

In liposomes, the active principles are water soluble and are hosted in the inner cavity, with little, if any, interaction taking place between the hydrophilic principle and the surrounding lipid core. Conversely, herbosome's host their polyphenolic guest, generally little soluble both in water and in lipids, at their surface where the polar functionalities of the lipophilic guest interact via hydrogen bonds and polar interactions with the charged phosphate head of phospholipids, forming a unique arrangement that can be evidenced by spectroscopy

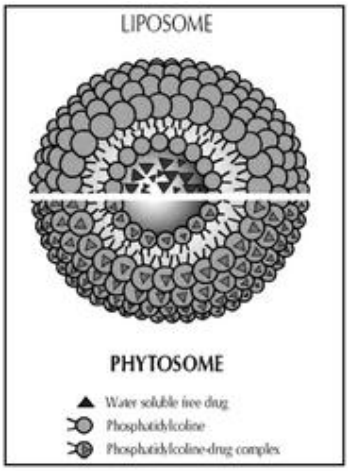


**Fig. 3: Major difference between liposome and herbtosome. The molecular organization of the liposome (upper segment) versus many individual herbosomes (lower segment).**

The herbosome formulation also increases the absorption of active ingredients when topically applied on the skin, and improves

systemic bioavailability when administered orally. In water medium, a herbosome will assume a micellar shape, forming a spherical structure, overall similar to a liposome, but with a different guest localization.

**Methods of preparation**

1. Herbosomes are novel complexes which are prepared by reacting from 3-2 moles but preferably with one mole of a natural or synthetic phospholipid, such as phosphatidylcholine, phosphatidylethanolamine or phosphatidyiserine with one mole of component for example- flavolignanans, either alone or in the natural mixture in aprotic solvent such as dioxane or acetone from which complex can be isolated by precipitation with non solvent such as aliphatic hydrocarbons or lyophilization or by spray drying. In the complex formation of herbosomes the ratio between these two moieties is in the range from 0.5-2.0 moles. The most preferable ratio of phospholipid to flavonoids is 1:1. [14]
2. Naringenin–PC complex was prepared by taking naringenin with an equimolar concentration of phosphatidylcholine (PC). The equimolar concentration of PC and naringenin were placed in a 100 mL round bottom flask and refluxed in dichloromethane for 3 h. On concentrating the solution to 5–10 mL, 30 mL of n-hexane was added to get the complex as a precipitate followed by filtration. The precipitate was collected and placed in vacuum desiccators.[15]
3. The required amounts of drug and phospholipids were placed in a 100 ml round-bottom flask and dissolved in anhydrous ethanol. After ethanol was evaporated off under vacuum at 40 ?C, the dried residues were gathered and placed in desiccators overnight, then crushed in the mortar and sieved with a 100 mesh. The resultant silybin–phospholipid complex was transferred into a glass bottle, flushed with nitrogen and stored in the room temperature. [16]

**Common steps of preparation of herbosomes**

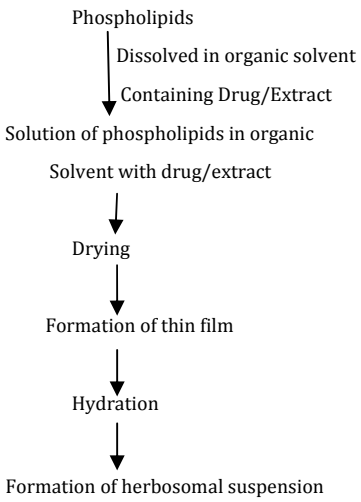


**Fig. 2: Common stages for preparation of herbosomes [17]**

**Properties of Herbosomes** [18,19,20,21,22]

The term herbosome is used to define a complex between a natural product and natural phospholipids, like soy phospholipids that are obtained by the reaction of stoichiometric amounts of phospholipids and phytoconstituents in an appropriate solvent. Spectroscopic data reveal that the main phospholipid-substrate interaction is due to the formation of hydrogen bonds between the polar head of the phospholipids (i.e., phosphate and ammonium groups) and the polar functionalities of the substrate.

1. Herbosomes can accommodate the active principle that is anchored to the polar head of the phospholipids, becoming an integral part of the membrane. For example, in case of the catechin-distearoyl PC complex, there is formation of H-bonds between the phenolic hydroxyls of the flavones moiety and the phosphate ion on the PC side.

2. PC: Study of comparisons of nuclear magnetic resonance of the complex with those of the pure precursors indicates that the signals of the fatty chain are almost unchanged. Such evidences inferred that the two long aliphatic chains are wrapped around the active principle, producing a lipophilic envelope that shields the polar head of the phospholipid and the catechin.[19]

3. Herbosomes are advanced forms of herbal products that are better absorbed, utilized and, as a result, produce better results than conventional botanical herbal extracts. The increased bioavailability of the herbosome over the non-complexed botanical derivatives has been demonstrated by pharmacokinetic studies or by pharmacodynamic tests in experimental animals and in human subjects.[20]

4. Herbosomes are lipophilic substances with a definite melting point, freely soluble in non-polar solvents, and moderately soluble in fats.

5. When treated with water, they assume a micellar shape, forming structures that resemble liposomes exhibiting fundamental differences.

**Advantages of herbosomes** [21 ,22, 23]

1. It enhances the absorption of lipid insoluble polar phytoconstituents through oral as well as topical route showing better bioavailability, hence significantly greater therapeutic benefit.
1. Appreciable drug entrapment.
2. As the absorption of active constituent(s) is improved, its dose requirement is also reduced.
3. Phosphatidylcholine used in preparation of herbosomes, besides acting as a carrier also acts as a hepatoprotective, hence giving the synergistic effect when hepatoprotective substances are employed.
4. Chemical bonds are formed between phosphatidylcholine molecule and phytoconstituent, so the herbosomes show better stability profile.
5. Application of phytoconstituents in form of herbosome improve their percutaneous absorption and act as functional cosmetics.
6. Added nutritional benefit of phospholipids.
7. Herbosome permeates the non-lipophilic botanical extract to be better absorbed in intestinal lumen.
8. Herbosome are been used to give liver protectant flavonoids because they were easily bioavailable.
9. Unlike liposome, chemical bonds are formed between phosphatidylcholine molecule and phytoconstituent, so the Herbosomes show better stability profile.
10. By improving the solubility of bile to herbal constituent, liver targeting can be facilitated.

**Disadvantages**

1. Phytoconstituent is rapidly eliminated from herbosomes.

**Characterization of herbosomes** [24,25]

Herbosomes are characterized for physical attributes, i.e. shape, size, its distribution, percentage drug capture, entrapped volume, percentage drug release, and chemical composition. Hence, behavior of Herbosomes in both physical and biological systems is governed by the following factors:

1. Physical size
1. Membrane permeability
2. Percent entrapped solutes
3. Chemical composition
4. Quantity and purity of the starting materials

**Evalution of herbosomes**

**I.Characterization technique**

**1. Visualization: -** Visualization of herboosomes can be achieved using transmission electron microscopy (TEM) and by scanning electron microscopy (SEM) [26].

**2. Vesicle size and zeta potential: -** The particle size and zeta potential can be determined by dynamic light scattering (DLS) using a computerized inspection system and photon correlation spectroscopy (PCS) [27].

**3. Entrapment efficiency:-**The entrapment efficiency of a drug by herbosomes can be measured by the ultracentrifugation technique [28].

**4. Transition temperature :-**The transition temperature of the vesicular lipid systems can be determined by differential scanning calorimetry [29].

**5. Surface tension activity measurement:-**The surface tension activity of the drug in aqueous solution can be measured by the ring method in a Du Nouy ring tensiometer [30].

**6. Vesicle stability**:-The stability of vesicles can be determined by assessing the size and structure of the vesicles over time. The mean size is measured by DLS and structural changes are monitored by TEM [31].

**7. Drug content**:-The amount of drug can be quantified by a modified high performance liquid chromatographic method or by a suitable spectroscopic method [32].

**II. Spectroscopic evaluations** To confirm the formation of a complex or to study the reciprocal interaction between the phytoconstituent and the phospholipids, the following spectroscopic methods are used [33].

**1.$^{1}$H-NMR**

The NMR spectra of (+)-catechin and its stoichio- metric complex with distearoylphosphatidylcholine have been studied by Bombardelli et al [34]. In nonpolar solvents, there is a marked change of the 1H-NMR signal originating from the atoms involved in the formation of the complex, without any summation of the signal peculiar to the individual molecules. The signals from the protons belonging to the flavonoids are to be broadened that the proton cannot be relieved. In phospholipids, there is broadening of all the signals while the singlet corresponding to the N-(CH3)3 of choline undergoes an uplift shift. Heating the sample to 60° results in the appearance of some new broad bands, which corres-pond mainly to the resonance of the flavonoid moiety.

**2. $^{13}$C-NMR**

In the $^{13}$C-NMR spectrum of (+)-catechin and its stoichiometric complex with distearoylphosphatidylcho-line, particularly when recorded in $C_6D_6$ at room temperature, all the flavonoid carbons are clearly invisible. The signals corresponding to the glycerol and choline portion of the lipid (between 60–80 ppm) are broadened and some are shifted, while most of the resonances of the fatty acid chains retain their original sharp line shape. After heating to 60°, all the signals belonging to the flavonoid moieties reappear, although they are still very broad and partially overlapping.

**3. FTIR**

The formation of the complex can be also be confirmed by IR spectroscopy by comparing the spectrum of the complex with the spectrum of the individual components and their mechanical mixtures.

FTIR spectroscopy is also a useful tool for the control of the stability of phytosomes when micro-dispersed in water or when incorporated in very simple cosmetic gels. From a practical point of view, the stability can be confirmed by comparing the spectrum of the complex in solid form (phytosomes) with the spectrum of its microdispersion in water after lyophilization, at different times. In the case of simple formulations, it is necessary to subtract the spectrum of the cosmetic form at different times, comparing the remaining spectrum of the complex itself.

**III. In vitro and in vivo evaluations**

Models of in-vitro and in-vivo evaluations are selected on the basis of the expected therapeutic activity of biologically active phytoconstituents present in the herbosomes [33]. For example, in-vitro antihepatotoxic activity can be assessed by the antioxidant and free radical scavenging activity of the herbosomes. For assessing antihepatotoxic activity in-vivo, the effect of prepared phytosomes on animals against thioacetamide-, paracetamolor alcohol- induced hepatoxicity can be examined [35,36]. Skin sensitization and tolerability studies of glycyrrhetinic acid-Phytosome® ointment, a commercial product, describe the in vivo safety evaluation methodology [37]

**Applications of phytosomes**[38,40,41,42]

Different herbosome products have demonstrated significant therapeutic effects when compared with the conventional plant extracts.

**Table 1: Commercial phytosomes preparation** [19,39,40,41,42]

| Phytosomes | Phytoconstituent complexed phosphatidylcholine | Indication | Dose |
|---|---|---|---|
| Silybin phytosome | Silybin from silymarin marinum | nutraceutical,antioxida for liver and skin | 120mg |
| Ginkgo phytosomes | 24%gingkgo flavonoids from; Ginkgo biloba | protect brain and vascular lining; anti skin ageing agent | 120mg |
| Green tea phytosomes | *epigallocatechin 3-o-gallate From camellia sinensis* | *anticancer, nutraceutical* systemic antioxidant | 50-100mg |
| Olive oil phytosomes | polyphenols from europaea Oil | anti oxidant, anti inflamma -tory anti-hyperlipidemic | _ |
| Grape seed phytosome | procynidins from vitis vinifera | nutraceutical,systemic antioxidant | 50-100mg |
| Haw thorn phytosome | flovonoids from Carteagus sp. | nutraceutical,cardio-protective, Antihypertensive | 100mg |
| Centella phytosomes | Terpenes | vein and skin disorders | _ |
| Ecdhinacea phytosome | echinacosides from Echinacea angustifolia | nutraceutical, immunomodulator | _ |
| Ginseng phytosome | 37.5% ginsenosides from Panax ginseng | nutraceutical, immunomodulator | 150mg |

**Recent research**

Recent research shows enhanced absorption and bioavailability with herbosomes compared with the conventional delivery systems.

- Most of the herbosome studies are focused on ***Silybum marianum*** (Milk thistle), which contains premier liver-protectant flavonoids.

Silymarin primarily contains three flavonoids of the subclass flavonol (having a fully saturated C-ring). Silybin predominates, followed by silydianin and silychristin. Silybin is actually a flavonolignan, probably within the plant by the combination of a flavonol with a coniferyl alcohol. It is now known that Silybin is the most potent of the three. Silymarin has been shown to have positive effects in treating liver diseases of various kinds, including hepatitis,

cirrhosis, fatty infiltration of the liver (chemical- and alcohol-induced fatty liver), and inflammation of the bile duct.[43]

The antioxidant capacity of Silymarin substantially boosts the liver's resistance to toxic chemicals.[44] The fruit of the Milk thistle plant contains flavonoids known for hepatoprotective effects.[43,45] Silybin is the chief and most potent constituent of Silymarin, the flavonoids complex from Milk thistle. A standardized extract from *Silybum marinum* is an excellent liver protectant but is poorly absorbed orally.

Silybin protects the liver by conserving glutathione in the parenchymal cells, while PC helps to repair and replace cell membranes. [44,46] These constituents are likely to offer the synergistic benefit of sparing liver cells from destruction. In its native form within the Milk thistle fruit, Silybin occurs primarily complexed with sugars, as a flavonyl glycoside or flavonolignan. Silybin has been extensively researched and found to have impressive bioactivity, although limited by poor bioavailability.

Tedesco *et al.* reported that the Silymarin phytosomes show better anti-hepatotoxic activity than Silymarin alone and can provide protection against the toxic effects of Aflatoxin B1 on the performance of Broiler chicks.[47] Busby *et al.* reported that the use of a Silymarin phytosome showed a better fetoprotectant activity from ethanol-induced behavioral deficits than uncomplexed Silymarin. [48]

Grange *et al.*[49] conducted a series of studies on the Silymarin phytosome containing a standardized extract from the seeds of *Silybum marinum* administered orally to animals and found that it could protect the fetus from maternally ingested ethanol.

Yanyu *et al.*[50] prepared the Silymarin phytosome and studied its pharmacokinetics in rats. In the study, the bioavailability of Silybin in rats was increased remarkably after oral administration of the prepared Silybin-phospholipid complex due to an impressive improvement of the lipophilic property of the Silybin-phospholipid complex and improvement of the biological effect of Silybin.

Barzaghi *et al.*[51] conducted a human study designed to assess the absorption of Silybin when directly bound to PC. The plasma Silybin levels were determined after administration of a single oral dose of Silybin phytosome and a similar amount of Silybin from Milk thistle to healthy volunteers. The results indicated that the absorption of Silybin from the Silybin phytosome is approximately seven-times greater compared with the absorption of Silybin from the regular Milk thistle extract (70-80% Silymarin content).

Mascarella *et al.*[52] in one study of 232 patients with chronic hepatitis treated with the Silybin phytosome at a dose of 120 mg either twice daily or thrice daily for up to 120 days, investigated and found that the liver function returned to normal faster in patients taking the Silybin phytosome compared with a group of controls (49 treated with commercially available Silymarin, 117 untreated or given placebo).

Bombardelli *et al.*[53] reported that Silymarin phytosomes showed a much higher specific activity and a longer lasting action than the single components with respect to the percent reduction of edema, inhibition of myeloperoxidase activity, and the antioxidant and free radical scavenging properties.

- **Grape seed** phytosome is composed of oligomeric polyphenols of varying molecular size complexed with phospholipids. The main properties of the procyanidin flavonoids of grape seed are in total antioxidant capacity and stimulation of physiological antioxidant defenses of plasma, protection against ischemia/reperfusion-induced damages in the heart, protective effects against atherosclerosis thereby offering marked protection for the cardiovascular system and other organs through a network of mechanisms that extend their antioxidant potency.[54]
- Maiti *et al.*[55] developed the **quercetin-phospholipid complex** by a simple and reproducible method and also showed that the formulation exerted better therapeutic efficacy than the molecule in rat liver injury induced by carbon tetrachloride.
- Maiti *et al.* developed phytosomes of **curcumin and naringenin** in two different studies. The antioxidant activity of the complex was significantly higher than pure curcumin in all dose levels tested. In the other study, the naringenin phytosome produced better antioxidant activity than the free compound with a prolonged duration of action, which may be helpful in reducing the fast elimination of the molecule from the body.[56,57]

**SUMMARY**

Regarding the usefulness of plant products, especially those containing favonoids and other phenolic compounds, it is necessary to have appropriate formulations and delivery systems which provide optimum delivery of the active ingredients. Herbosomal products show their potential in cosmetics as anti-aging agents and for the use of other non-pathogenic skin conditions. Herbosomes can play a vital role in efficient drug delivery of a broad spectrum of hepatoprotective phytoconstituents like flavones, xanthones, terpenes, etc.[58] More recently; these are considered as a value-added drug delivery system. From the literature, it is very evident that several plant extracts possess different significant pharmacological or health-promoting properties. These extracts can be standardized accordingly and may be formulated as herbosomes for systematic investigation of any improved potential and can be used rationally. After screening and selection of potential extracts or constituents from plants, herbosomes can be developed for therapeutic purposes like cardiovascular, anti-inflammatory, immune-modulator, anti-cancer, anti-diabetic, etc. for prophylactic and health purposes as nutraceuticals in due course.

**CONCLUSION**

This review is an attempt to present a concise profile of herbosomes as a delivery system. Herbosomes are novel formulations which offer improved bioavailability of hydrophilic favonoids and other similar compounds through the skin or gastrointestinal tract. They have many distinctive advantages over other conventional formulations. The formulation methodology for herbosome is simple and can be easily upgraded to a commercial scale. The characterization methodologies and analytical techniques are well established for this type of novel formulation. Many patents are already approved for innovative formulations, processes and applications of herbosomes. As far as the potential of herbosome technology is concerned, it has a great future for use in formulation technology and applications of hydrophilic plant compounds.

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