DEVELOPMENT, CHARACTERIZATION, AND EVALUATION OF ROSA ALBA L EXTRACT-LOADED PHYTOSOMES

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ABSTRACT

In today's modern world, medicinal plants and the phytochemicals they contain are an excellent choice of treatment for a wide variety of illnesses. However, because of their low selectivity and bioavailability, their clinical applicability may be severely limited. As a consequence of this, the phytosome technology that was developed by Indian researchers is a cutting-edge strategy that was developed in an effort to address the issue of low bioavailability. The term "phyto" is used to refer to plants, and "some" is used to refer to individual cells. This cutting-edge formulation combines a standardised plant extract with phospholipids in order to produce lipid-compatible molecular complexes with enhanced absorption and bioavailability. Both the phosphatidyl moiety, which serves as the head of the bifunctional compound and is naturally lipophilic, and the choline moiety, which serves as the tail of the bifunctional compound and is naturally hydrophilic, are examples of chemical compounds. The hydrophilic phytoconstituents are bound to the choline portion of the phosphatidylcholine molecule, and the phosphatidyl part of the phosphatidylcholine molecule, which is lipid-soluble, then envelops the choline-bound complex. As a consequence of this, a phyto-phospholipid complex that has an increased lipid solubility is produced. Phytosomes have a number of advantages, including increased bioavailability, enhanced nutrient efficiency, and improved trapping effectiveness. Phosphatidylchloride is a

crucial component of phytosomes because it not only acts as a sustain but also as an efficient drug loading capacity. The purpose of this study was to create a phytosome by making use of the flower extract of Rosa alba L.

KEYWORDS: Phytosome, Rosa Alba, Novel Preparation, Herbal.

INTRODUCTION

Medications derived from plants have been traditionally used on a worldwide scale in the treatment of human healthcare. Herbal medicinal plants are able to fulfil the majority of people's basic or primary healthcare needs in a variety of countries and regions around the globe. This is particularly true in regions where the local population does not have easy access to modern drugs, since this is a significant barrier to healthcare provision. People who had more experience with herbal medicine have, from the beginning of time, shared their knowledge with others who had less of an understanding of the subject. This custom has been carried on for a good many years. As a result of the fact that traditional plant medicines have major roots in either tradition or philosophy, the younger generation all around the globe is doing study on plants as possible sources of medicine. This treatment approach has the potential to successfully treat a wide range of conditions with just minimal adverse effects. Natural cures derived from plants known for their curative properties have been used to treat a variety of disorders affecting humans. Plants are able to fulfil the needs of other animals in addition to those of humans since they contain a wide array of various bioactive compounds. This allows plants to be a source of food. Phytomedicines, also known as preparations that are manufactured from plants or parts of plants, have been extensively utilised in traditional medicine ever since the ancient times, and the vast majority of people all over the globe continue to use these types of medicines today. [1] A wide variety of plant extracts have been the focus of chemical and pharmacological research over the course of the past century. This has been done in an effort to gain a deeper comprehension of the components that constitute their chemical composition and to provide support for the suggestions that are made by conventional medicine. It has been said very often that the process of isolating and purifying the several components that make up an extract may result in the refined component losing part of the one-of-a-kind functionality that the extract has.

Phytosome

The word "phyto" may be used to refer to either a plant or an item that is cell-like in appearance. A phytosome is a cutting-edge piece of technology that is used to encapsulate plant extracts in lipid and then bind them together. This results in the creation of phytopharmaceuticals. Traditional medicinal practises and medications made from plants have been utilised for a wide range of therapeutic reasons that have been shown to be highly effective for maintaining one's health ever since the beginning of recorded history. Only lately has the delivery of plant medicines been perfected to the point where they can effectively cure human ailments. Herbal remedies are becoming more popular in every region of the world as a method of self-medication and a means to get healthcare beyond the conventional boundaries of contemporary medicine. The vast majority of the bioactive components found in phytomedicines are molecules that are soluble in water. However, the

efficiency of water-soluble phytoconstituents is limited when they are either consumed orally or administered topically because of their low absorption [1].

By combining standardised plant extracts or water-soluble phytoconsituents with phospholipids to create lipid-compatible molecular complexes known as phytosomes, a leading manufacturer of pharmaceuticals and nutraceuticals has developed a patented technology that significantly improves the absorption and bioavailability of their products. This technology is protected by a patent and was awarded to the company [2].

The Phytosomes procedure keeps the vital components of the herbal extract from being degraded by the bacteria that are normally found in the digestive system as well as the digestive secretions that are produced by the body. Because the enterocyte cell membrane is a lipid-friendly environment, phytosomes are better able to transfer from this environment into the cell before reaching the blood. This occurs before the phytosomes reach the blood. [3]

Throughout the course of the last century, research in the fields of phytochemistry and phytopharmacology has shed light on the chemical and biological components, biological processes, and health-promoting qualities of a wide variety of plant products. Compounds that are either polar or water-soluble make up the bulk of the biologically active chemicals found in plants. However, flavonoids, tannins, and other phytoconstituents that are soluble in water are poorly absorbed due to either their large molecular size, which prevents passive diffusion, or their poor lipid solubility, which severely limits their ability to cross lipid-rich biological membranes and results in poor bioavailability. Both of these factors contribute to the fact that flavonoids, tannins, and other phytoconstituents that are soluble in water have a low bioava [4]

Principle of Phytosome Technology

The phytochemical elements in the extracts, such as the flavonoids and terpenoids, allow the extracts to directly bind with phosphatidylcholine. A phytosome is created when a standardised extract or polyphenolic ingredient combines with a stoichiometric quantity of phospholipid in a non-polar solvent. There are several uses for phytosomes. The bifunctional phosphatidylcholine molecule is composed of the lipophilic phosphatidyl moiety and the hydrophilic choline moiety. The lipid-soluble body and tail of the phosphatidylcholine molecule surround the choline-bound substance after the phosphatidylcholine molecule's head binds to a phytocomponent. As a result, a molecule combination compatible with lipids, the phyto-phospholipid complex, is created when the phytoconstituents and phospholipid combine. [5]

MATERIAL AND METHODOLOGY

A collection of plant material In April of 2021, blossoms of the Rosa alba L species were gathered from the region near Bhopal. When it was necessary, dried flowers from Rosa alba L. were ground up, and the resulting powder was stored in plastic bags with tight-fitting lids. The plants were chosen because of the ease with which they may be obtained and the traditional uses to which they are put. [6]

Extraction

The Rosa alba L. plant's petals were let to dry naturally in the shade. The plant material was sun-dried, milled into a coarse powder, and then subjected to the maceration extraction procedure with petroleum ether. The material was removed many times until the necessary amount of fatty content was attained. The combination was extracted with a hydroalcoholic

solvent (ethanol: water: 75:25), filtered, and dried in a vacuum evaporator at a temperature of 400 degrees Celsius after being macerated for 48 hours with dried powdered Rosa alba flower.

Determination of percentage yield

The percentage yield of each extract was calculated by using following formula:

Percentage yield = Weight of Extract x 100 / Weight of Powder Drug Taken

Phytochemical Screening

The extract underwent phytochemical analysis using the industry-standard procedures.[6]

1. Detection of alkaloids: Extracts were dissolved individually in dilute Hydrochloric acid and filtered.

Wagner's Test: Filtrates were treated with Wagner's reagent (Iodine in Potassium Iodide). Formation of brown/reddish precipitate indicates the presence of alkaloids.

Hager's Test: Filtrates were treated with Hager's reagent (saturated picric acid solution). Presence of alkaloids confirmed by the formation of yellow coloured precipitate.

2. Detection of carbohydrates: Extracts were dissolved individually in 5 ml distilled water and filtered. The filtrates were used to test for the presence of carbohydrates.

Fehling's Test: Filtrates were hydrolysed with dil. HCl, neutralized with alkali and heated with Fehling's A & B solutions. Formation of red precipitate indicates the presence of reducing sugars

3. Detection of glycosides: Extracts were hydrolysed with dil. HCl, and then subjected to test for glycosides.

Legal's Test: Extracts were treated with sodium nitropruside in pyridine and sodium hydroxide. Formation of pink to blood red colour indicates the presence of cardiac glycosides.

4. Detection of Saponins

Froth Test: Extracts were diluted with distilled water to 20ml and this was shaken in a graduated cylinder for 15 minutes. Formation of 1 cm layer of foam indicates the presence of saponins.

Foam Test: 0.5 gm of extract was shaken with 2 ml of water. If foam produced persists for ten minutes it indicates the presence of saponins.

5. Detection of phenols

Ferric Chloride Test: Extracts were treated with 3-4 drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenols.

6. Detection of tannins

Gelatin Test: To the extract, 1% gelatin solution containing sodium chloride was added. Formation of white precipitate indicates the presence of tannins.

7. Detection of flavonoids

Alkaline Reagent Test: Extracts were treated with few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on addition of dilute acid, indicates the presence of flavonoids.

Lead acetate Test: Extracts were treated with few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of flavonoids.

8. Detection of proteins

Xanthoproteic Test: The extracts were treated with few drops of conc. Nitric acid. Formation of yellow colour indicates the presence of proteins.

9. Detection of diterpenes

Copper acetate Test: Extracts were dissolved in water and treated with 3-4 drops of copper acetate solution. Formation of emerald green colour indicates the presence of diterpenes.

Quantitative estimation of bioactive compounds

Total Phenolic content estimation

The modified Folin-Ciocalteu technique was used in order to provide an accurate reading of the total phenolic content of the extract. [7] After dissolving 10 mg of gallic acid in 10 ml of methanol, a series of aliquots with concentrations ranging from 5 to 25 g/ml were produced. Following the dissolution of 10 mg of dried extracts in 10 ml of methanol, the mixture was filtered. For the purpose of this computation, two millilitres (1 mg/ml) of the phenol content of this solution were employed. After diluting the Folin-Ciocalteu reagent with distilled water at a ratio of 1:10 volume to volume, two millilitres of each extract or standard were added, along with one millilitre (7.5 g/l) of sodium carbonate, to a millilitre of the reagent. The mixture was then stirred. After giving the combination a 15-second whirl in a vortex, it was then let to sit undisturbed for 15 minutes so that the colour could develop. The absorbance was determined by analysing the sample using a spectrophotometer set at 765 nm.

Total flavonoids content estimation

The total flavonoids content was calculated using the aluminium chloride method. [8] A series of aliquots containing 5–25 g/ml of quercetin were created when 10 mg of quercetin was dissolved in 10 ml of methanol. After combining 10 mg of dried extracts with 10 ml of methanol, the mixture was filtered. The flavonoid content of this solution was ascertained using three millilitres of it at a concentration of one milligramme per millilitre. The 2% AlCl3 methanolic solution was combined with 3 ml of extract or standard, and the combination was then let to sit at room temperature for 15 minutes. Three times this surgery was done. The absorbance was then assessed at a 420 nm wavelength.

Formulation development of Phytosomes [9]

Cholesterol and Rosa alba L were combined in the following proportions to produce the complex: 1:.5:1, 1:1:1, 2:1.5:1, and 2:2:1. The calculated amounts of extract, phospholipids, and cholesterol were added to a round-bottom flask with a volume of one hundred and fifty millilitres, and 25 millilitres of dichloromethane was used as the reaction medium. In order to complete the difficult reaction, the mixture was allowed to reflux at a temperature of fifty degrees Celsius for three hours. After the resulting clear liquid had been evaporated, 20 ml of n-hexane was then added to the mixture. In order to get rid of any trace of the solvent, the precipitate was filtered and then vacuum-dried. After being collected, the leftovers were allowed to dry out overnight before being stored in a container made of amber-colored glass at room temperature.

Table 1: Different formulations of Phytosomes

Formulation Code	Ratio of Phospholipids and Cholesterol	Extract Concentration (%)	Dichloromethane Concentration
Optimization of Phospholipids and Cholesterol			
F1	1:0.5	1.0	25
F2	1:1	1.0	25
F3	1:1.5	1.0	25
F4	1:2	1.0	25
Optimization of Drug Concentration			
F5	1:1	0.5	25
F6	1:1	1.0	25
F7	1:1	1.5	25
F8	1:1	2.0	25
Optimization of solvent concentration			
F9	1:1	1.0	10
F10	1:1	1.0	25
F11	1:1	1.0	50
F12	1:1	1.0	75

Characterization of Phytosomes

Entrapment efficiency[10]

A phytosome preparation was made, and then it was centrifuged for an hour at a speed of 12000 revolutions per minute while using a cooling centrifuge (Remi).

The flavonoids that were not caught were removed by syphoning the clear supernatant in order to get rid of them.

At a maximum wavelength of 420.0 nm, an absorbance reading was taken using a UV/visible spectrophotometer (Labindia 3000+) for the non-entrapped Rosa alba L extract. This reading was taken from the clear supernatant. After lysing the vesicles in the sediment by treating it with 1 ml of 0.1% Triton x 100 and then diluting it to 100 ml with 0.1 N HCl, the absorbance of the sediment was measured at 420.0 nm. The total amount of Rosa alba L extract that was present in a 1 ml dispersion was determined by using the concentration of quercetin that was found in both the supernatant and the sediment. The following formula was used in the determination of the percentage of entrapment.

$$\text{Entrapment efficiency (\%)} = [(Wa–Ws)/Wa]\times100$$

$$\text{Drug loading (\%)} = [(Wa–Ws)/(Wa–Ws+Wl)]\times100$$

Where Wa is the amount of drug added to formulation, Ws is the amount of free drug, and Wl is the weight of oil phase.

Particle size and size distribution [11]

An improved phytosomes formulation was evaluated using a computerised inspection system equipped with dynamic light scattering (DLS) to determine the particle size, size distribution, and zeta potential of the increased phytosomes formulation (Malvern Zetamaster ZEM 5002,

Malvern, UK). The electric potential of the phytosomes, including that of its Stern layer, was found by using the zeta potential of the system after it had been diluted.

Transmission electron microscopy

After 15 minutes, a drop of the sample was placed on a copper grid that had been coated with carbon, and the grid was then negatively stained with an aqueous solution that included 1% phosphotungustic acid. After that, TEM was used to conduct an analysis of the surface morphology. After the grid had been allowed to completely dry down, the materials were examined using transmission electron microscopy (TEM) (TEM Hitachi, H-7500 Tokyo, Japan) [12].

In vitro dissolution rate studies

A USP-type I dissolving equipment was used to evaluate the material for in vitro drug release (Basket type). The dissolving flask was filled with 900 ml of 0.1N HCl, and then the temperature and rotational speed were maintained at 37 degrees Celsius and 75 revolutions per minute, respectively. Ten milligrammes of the produced phytosomes were placed in each basket of the dissolving apparatus. The machine was allowed to run for eight straight hours. Three-milliliter samples were taken throughout a 12-hour period using a pipette with a 10 ml capacity at regular intervals of 30 minutes, an hour, two hours, four hours, six hours, eight hours, and twelve hours. The sample was introduced to fresh supplies of the dissolving medium at 370 degrees Celsius in the same quantity each time, and the absorbance of the sample at 256.0 nm was measured using spectroscopy. application of mathematics to the results of in vitro testing The quantitative interpretation of the data collected in dissolution/release tests is made considerably easier when mathematical equations are utilised to express the dissolution results as a function of certain dosage form factors. This is so that the data representation may be more easily understood using mathematical calculations [13]. In vitro dissolution has been recognized as an important element in drug development. To analysis the mechanism for the release and release rate kinetics of the formulated dosage form, the data obtained from conducted studies was fitted into Zero order, First order, Higuchi matrix, Korsmeyer- Peppas and Hixson Crowell model. (Table 1) In this by comparing the r-values obtained, the best-fit model was selected. [14]

Table 2: Interpretation of diffusional release mechanisms

Release exponent (n)	Drug transport mechanism	Rate as a function of time
0.5	Fickian diffusion	$t^{-0.5}$
$0.5<n<1.0$	Anomalous transport	t^{n-1}
1.0	Case-II transport	Zero-order release
Higher than 1.0	Super Case-II transport	t^{n-1}

Stability studies of optimize phytosomes formulation

Stability studies were completed for advanced detailing according to ICH recommendations, the produced phytosomes underwent stability testing at 40°C/75°RH and 30°C/60%RH for three months. At 1-month intervals, samples were taken out and actual appearance, rheological properties, pH, and rate discharge and drug content by UV- Visible spectrophotometer [15].

RESULTS AND DISCUSSION

Determination of percentage yield

Table 3 shows the yield of extracts produced from various materials using Pet. ether and hydroalcoholic as solvents.

Table 3: Percentage Yield.

S.No	Solvents	% Yield
1	Pet ether	**1.78**
2	Hydroalcoholic	**7.71**

Phytochemical screening of extract

A small portion of the dried extracts underwent phytochemical analysis utilising Kokate's methods (1994). Each sample's extract underwent a separate analysis to determine if it contained alkaloids, glycosides, saponins, flavonoids, and phenol. Using sterile water that has been distilled, a little amount of each extract is properly resuspended, resulting in a concentration of 1 mg per ml. Table 4 presents an alternate analysis of the data. [16-20]

Table 4: Phytochemical screening of extract of Rosa alba L.

S.No	Constituents	Hydroalcoholic extract
1	**Alkaloids** Wagner's Test Hager's test	**-ve** **+ve**
2	**Glycosides** Legal's test	 **+ve**
3	**Flavonoids** Lead acetate Alkaline test	**+ve** **+ve**
4	**Phenolics** Ferric Chloride Test	 **+ve**
5	**Proteins** Xanthoproteic test	 **-ve**
6	**Carbohydrates** Fehling's test	 **+ve**
7	**Saponins** Froth Test Foam test	**+ve** **+ve**
8	**Diterpenes** Copper acetate test	 **-ve**
9	**Tannins** Gelatin Test	 **-ve**

Total Phenolic content estimation (TPC)

The amount of total phenolic compounds (TPC) was expressed as mg/100mg of gallic acid equivalent of the dry extract sample using the equation obtained from the calibration curve: y = 0.038x + 0.021, R2= 0.998, where X is the gallic acid equivalent (GAE) and Y is the absorbance. [21-22]

Table 5: Preparation of the Calibration curve of Gallic acid

S. No	Concentration (µg/ml)	Mean absorbance
1	**2**	0.212
2	**4**	0.411
3	**6**	0.643
4	**8**	0.801
5	**10**	0.958

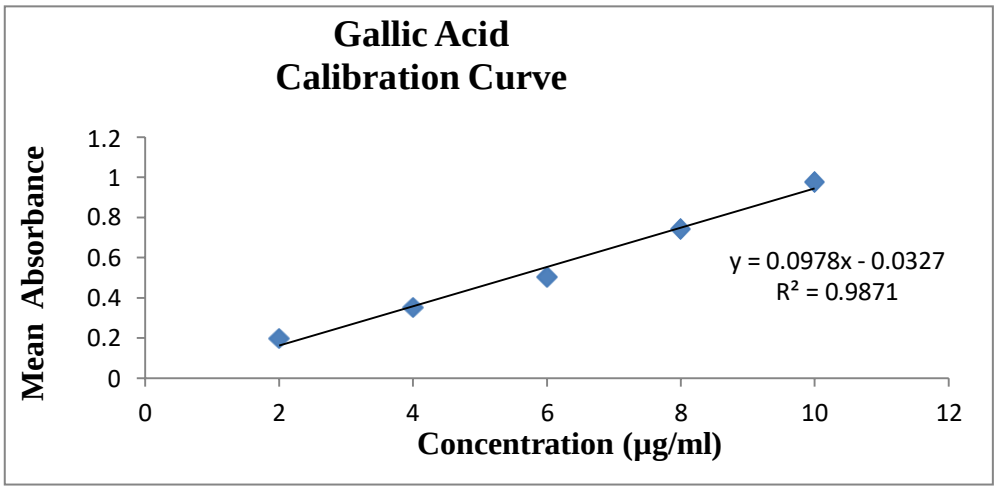

Figure 1: Graph of calibration curve of Gallic acid.

Total flavonoid content estimation (TFC)

The total flavonoid compound (TFC) content of the dry extract sample was calculated using the calibration curve equation: y = 0.038x - 0.003, R2 = 0.999. In this equation, X represents the quercetin equivalent (QE), and Y represents the absorbance. The TFC content was expressed as mg/100 mg quercetin equivalent.

Table 5 demonstrates the process of creating the quercetin calibration curve.

Table 5: Preparation of calibration curve of the Quercetin.

S. No	Concentration (µg/ml)	Mean absorbance
1	**2**	**0.196**
2	**4**	**0.351**
3	**6**	**0.502**
4	**8**	**0.742**
5	**10**	**0.978**

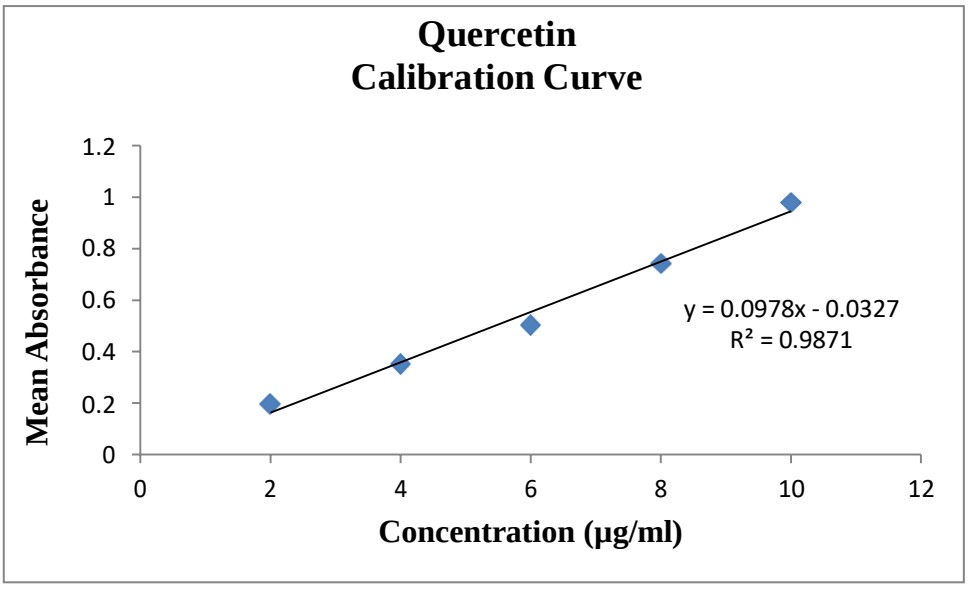

Figure 2: Graph of calibration curve of Quercetin.

Table 6: Total phenolic and total flavonoid content of Rosa alba L extract.

S. No	Extract	Total Phenol (mg/100mg)	Total Flavonoids (mg/100mg)
1	**Hydroalcoholic extract**	0.663	0.921

The total amount of phenolic and flavonoid content that was found in the hydroalcoholic extract of the Rosa alba L. flower may be shown in Table No. 6. The total phenolic and flavonoid content of the Rosa alba L. flower hydroalcoholic extract was measured to be 0.663 mg GAE/100 mg extract and 0.921 mg QAE/100 mg extract, respectively. The hydroalcoholic extract of Rosa alba L had the highest concentration of flavonoid and phenolic compounds, which is suggestive that the plant may have more potential as a therapeutic agent. [23-25]

Preparation of Phytosomes of Hydroalcoholic extract of Rosa alba L

In the course of this research, we developed a phospholipid-based chemical with the intention of improving Rosa alba L.'s lipophilic properties. We synthesised the complex by combining different amounts of phospholipids, cholesterol, and Rosa alba L in varying proportions, such as 1:0.5:1, 1:1,5, and 1:2 respectively. According to the findings, the ratio of Rosa alba L to phospholipids decreased the stability of the Rosa alba L-phospholipids combination. [26] We found that a Rosa alba L-phospholipids combination with a ratio of 1:1:1 was better to other formulations for obtaining the best complex while utilising the least quantity of phospholipid. This was the case when compared to other possible ratios.

Characterization of Phytosomes of Hydroalcoholic extract of Rosa alba L

Entrapment efficiency and particle size analysis

Entrapment effectiveness is a key aspect in the definition of phytosomes. The concentrations of the lipid, medicine, and alcohol were all changed to achieve the highest level of

encapsulation efficiency. The entrapment efficacy of each recipe produced is shown in Table 7. The entrapment efficiency of the phytosomes was found to range from 58.23 to 72.10 %. All formulations had particle sizes that ranged from 221.43 to 385.65 nm. Lipid content greatly affects phytosome size. Further evaluations of stability, TEM, and drug release studies are being conducted on the most efficient formulation, Formulation F10.

Table 7: Particle size and entrapment efficiency of drug loaded phytosomes

Formulation Code	Particle size (nm)	Entrapment Efficiency (%)
F1	323.15	58.23
F2	345.56	57.43
F3	334.34	55.32
F4	385.65	67.31
F5	375.56	62.44
F6	295.56	61.25
F7	264.65	60.32
F8	276.32	62.45
F9	292.11	60.25
F10	221.43	72.10
F11	272.34	68.38
F12	312.11	66.74

Average of three determinations (n=3)

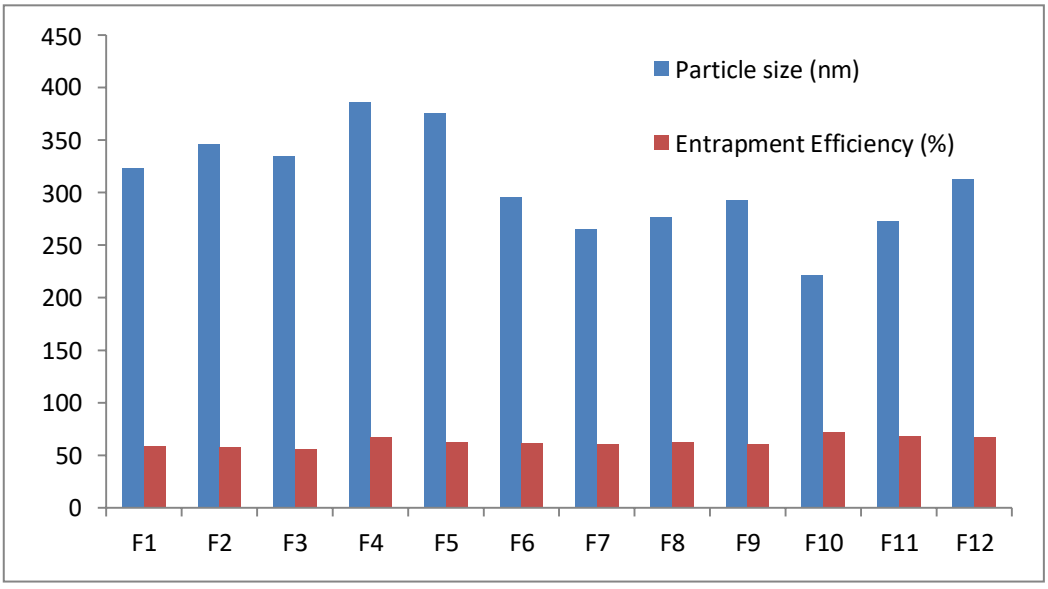

Figure 3: Graph of Particle size and entrapment efficiency

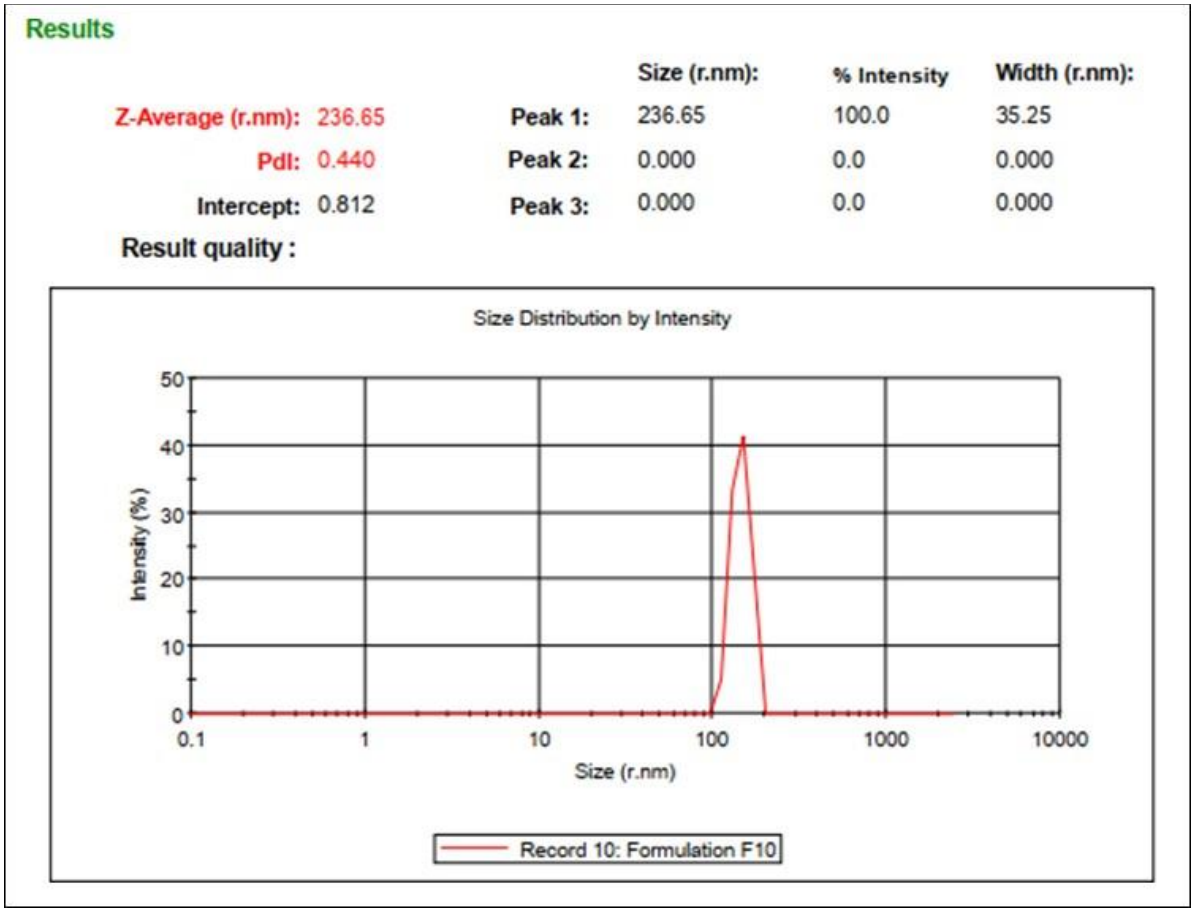

Figure 4: Particle size of optimized batch F10.

Transmission electron microscopy (TEM)

A beam of electrons is sent through an incredibly thin material using the TEM microscopy technique, interacting with the object as it does so. A picture is created by the interaction of the electrons that are transported through the specimen; the picture is then enlarged and focussed onto a fluorescent screen, a layer of photographic film, or a sensor like a CCD camera. As a result of the tiny de Broglie wavelength of electrons, TEMs can image at a resolution that is substantially higher than that of light microscopes. Since a single column of atoms is thousands of times smaller than the smallest resolvable item in a microscope, this allows the operator of the device to inspect fine detail in objects as small as those. In a variety of scientific domains, including the physical and biological sciences, TEM is a key analytical technique. The Phytosomes were characterised using TEM and found to be spherical in shape. However, significant size distribution variation was seen in the TEM image, which may be explained by an uncontrolled charge neutralisation process that took place between oppositely charged chains during the creation of phytosomes.

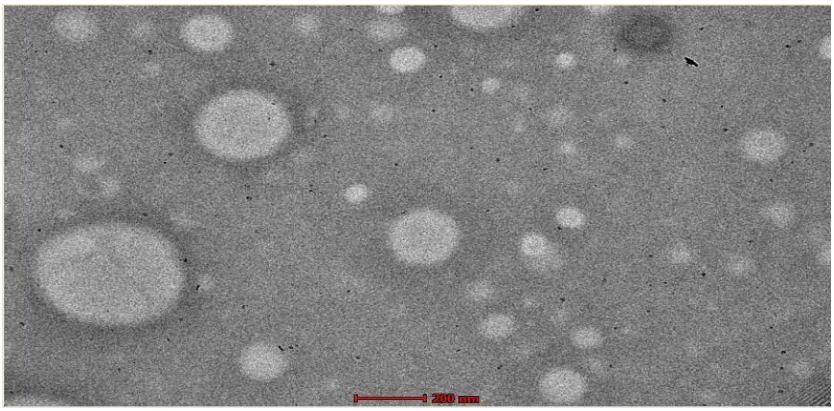

Figure 5: TEM image of phytosomes.

In vitro drug release study of prepared Phytosomes formulation

Table 8: In-vitro drug release data for optimized formulation F10.

S. No	Time(h)	Square Root of Time(h)$^{1/2}$	Log Time	Cumulative* % Drug Release	Log Cumulative % Drug Release	Cumulative % Drug Remaining	Log Cumulative % Drug Remaining
1	0.5	0.690	-0.298	24.46	1.461	78.03	1.941
2	1	1.1	0	28.89	1.582	69.22	1.851
3	2	1.512	0.432	42.54	1.687	57.52	1.767
4	4	2	0.589	69.18	1.853	36.21	1.473
5	6	2.529	0.778	82.43	1.944	18.44	1.201
6	8	3.120	0.912	90.23	1.967	9.21	0.890
7	12	3.648	1.249	98.88	1.993	2.11	0.071

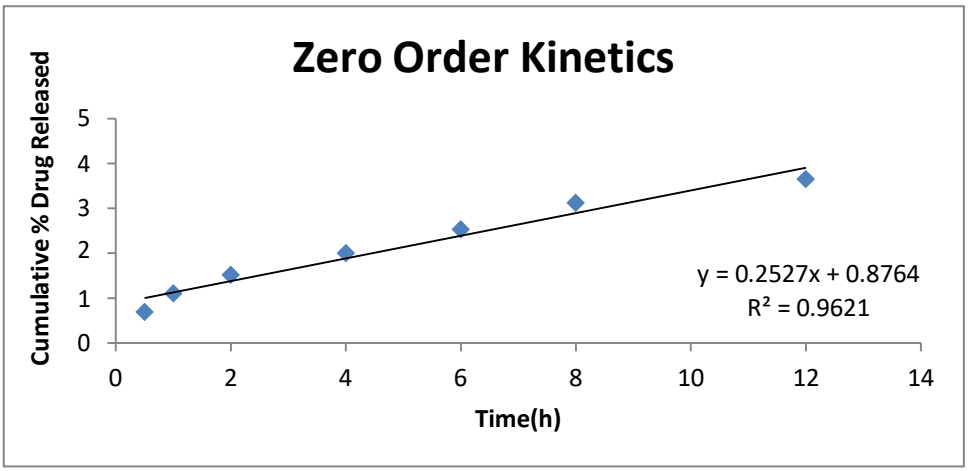

Figure 5.7: Cumulative % drug released Vs Time Zero Order Kinetics

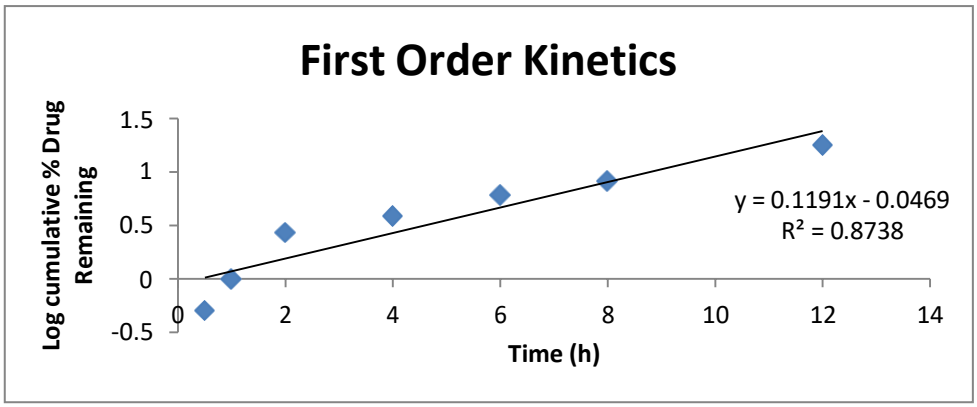

Figure 6: Log cumulative % drug remaining Vs Time (First Order Kinetics)

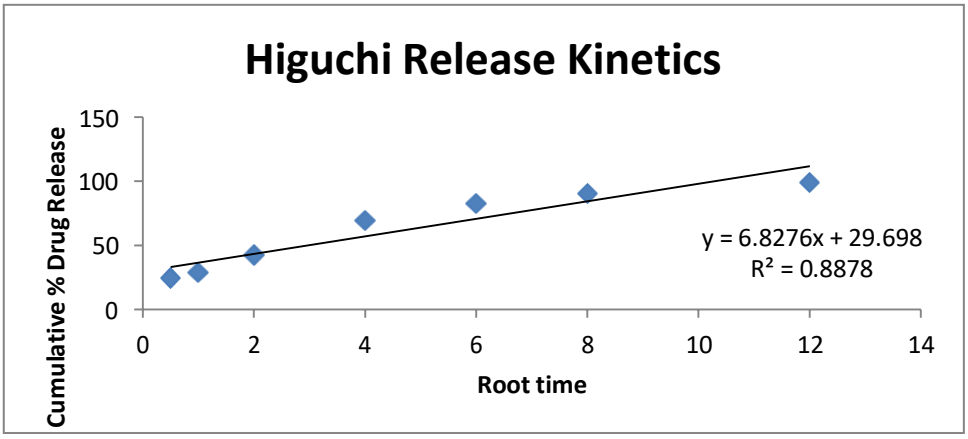

Figure 7: Cumulative % drug release Vs Root time (Higuchi Release Kinetics)

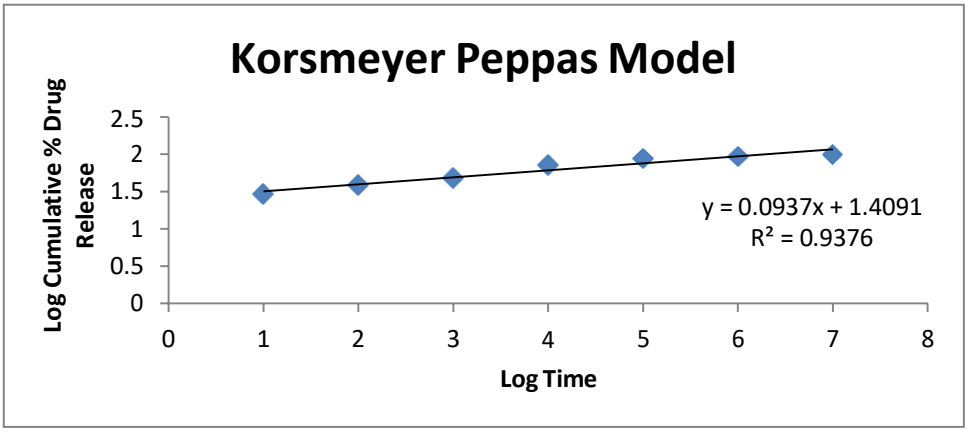

Figure 8: Log Cumulative % drug release Vs Log time (Korsmeyer Peppas Model)

Table 9: Regression analysis data of optimized formulation F10

Batch	**R^2 Value**			
	Zero Order	**First Order**	**Higuchi**	**Korsmeyer Peppas**
F10	0.9621	0.8738	0.8878	0.9376

The korsmeyer peppas model got the greatest "r2" values, equaling 0.9376, when the regression coefficient values were examined. When the values of the regression coefficients

were examined, this was found. This implies that the drug release kinetics from formulations was discovered to match the kinetics of Korsmeyer peppas.

Results of stability studies

Results of stability studies clearly indicates that optimized batches of phytosomes were stable over the chosen temperature and humidity conditions up to 3 months as were found no significant variation in physical appearance and % drug content.

CONCLUSION

In conclusion, the combined hydroalcoholic extract of Rosa alba L in the ratio of 1:1:1 was proven to display noteworthy results over the course of this inquiry. The phytosomes are superior than the extract in terms of their physical characteristics. According to the results of certain studies that were carried out in vitro, phytosomes managed to release their phytoconstituents. As a result, the clinical use of this herbal drug combination's phytosomal formulation may be used to boost the therapeutic effect.

Conflict of Interest; The authors declare that the review was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

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