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DEVELOPMENT AND EVALUATION OF SELF EMULSIFYING DRUG DOSAGE FORMULATION (SEDDF) OF COMMIPHORA WIGHTTI EXTRACT

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ABSTRACT

The herb Commiphoramukul, sometimes known as guggul, is commonly utilised by rural and tribal people to treat a variety of illnesses. The idea that natural medicines are safer and have fewer negative effects than synthetic ones makes them more acceptable. The demand for herbal formulations is rising on the global market. In the current work, an effort was made to improve the solubility, dissolution, and bioavailability of commiphorawightti extract (guggul) by developing and evaluating a self-emulsifying drug dosage formulation (SEDDF). Guggul extract's solubility in various oils, surfactants, and co-surfactants was measured. For the purpose of improving the formulation of microemulsions, pseudoternary phase diagrams were adopted. Based on their in-vitro drug release profile, globule size, zeta potential, and self-emulsifying assessment, the produced formulations of SEDDF were assessed. Studies on the in vitro release of the improved formulation F3 showed that the Higuchi equation best described the release profiles of SEDDF of guggul extract because the plots had the highest levels of linearity (coefficient of determination, R2=0.994). The optimised SEDDF formulation F3 was seen to have a 98.15% release after 60 minutes.

Keywords: Commiphoramukul, SEDDF, Microemulsion, Pseudoternary Phase diagram, Extract.

1. INTRODUCTION

Physiologically active compounds found in medicinal plants have been used for centuries in traditional medicine to treat a variety of diseases. Plants are said to have a wide range of active principles, according to scientists [1-3]. Alkaloids, flavonoids, coumarins, glycosides, gums, polysaccharides, phenols, tannins, terpenes, and terpenoids are only a few of the different families of chemical compounds known as phytochemicals, which are also sometimes referred to as "secondary metabolites" in reference to the chemical compounds produced by plants during their normal metabolic processes [4]. An important stage in the study of medicinal plants is the evaluation of the phytochemical components, both qualitatively and quantitatively [5]. Rapid and precise ways of screening plants for specific compounds have greatly assisted the advancement of phytochemistry [6]. The screening of

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medicinal plants for phytochemical content is done using a number of established techniques. Alkaloids, steroids, saponins, phenolics, flavonoids, saponins and cardiac glycosides, as well as tannins, are only a few of the many phytoconstituents. Known as "Indian bedellium," C. wightii (Arn.) Bhandari is a well-known herbal plant from the Burseraceae family"

"Mukul myrrh tree", "Gugal", "Gugulu," or "Guggul" are terms used in India. It is widely dispersed in tropical Asia, Madagascar, and Africa. It exists in Rajasthan, Gujarat, and Maharashtra in India [12]. Due to its anti-inflammatory, anti-rheumatic, hypocholesteremic, and anti-fertility properties, it is utilised in the allopathic, ayurvedic, and unani systems of medicine [13]. Guggul, a major oleo-gum resin produced by C. wightti, is used as an incense, a fixative in perfumery, and a medicine [14]. It is a complex blend of resin (61%), gum (29.3%), and other compounds (6.1%). Alkaloids, glycosides, steroids, terpenoids, flavonoids, coumarins, tannins, and anthraxquinones are just a few of the chemical compounds that C. wightii is known to contain. Guggulsterone, which is contained in gugulipid at concentrations of 4.0–6.0%, is the substance that makes it active. E-guggulsterone and Z-guggulsterone, stereoisomers of guggulsterone, are found in guggulipid. A powerful hypolipidemic agent is gugulipid. A significant range of therapeutic actions, including antibacterial, anthelmintic, anti-inflammatory, antiarthritic, and antioxidant ones, have been identified in addition to its hypolipidemic activity [14,15].

2. MATERIAL AND METHODS

2.1. Collection and preparation of plant material

Commiphorawightii stem barks were gathered in Bhopal. The plant was cleaned, cut into little pieces, dried out in the shade, and then mechanically ground into a coarse powder. After passing through sieve No. 40, the powder was placed in an airtight container for later use. Using the Soxhlet extraction method, 200 g of coarsely powdered plant material were successively extracted using petroleum ether and methanol as the solvents with increasing polarity. The powdered material was dried in a hot air oven each time before extraction with the subsequent solvent (specified temperature range). The solvent was then evaporated from each extract to create a concentrated form. For additional studies, all the extracts prepared in this manner were kept in airtight vials at 4 °C [16].

2.2. Solubility Profile

Guggul extract solubility was evaluated visually in phosphate buffer (pH 5.4), distilled water, methanol, ethanol, DMSO, chloroform, and acetone. One gramme of the drug, precisely weighed, was put into a clean, dry test tube. Each solvent was then added, the mixture was forcefully agitated, and the drug's solubility was assessed visually.

2.2.1. Determination of solubility in DMSO and phosphate buffer pH 5.4 mixture for determination of ratio

Ten tidy and dried volumetric flasks with a capacity of 10 ml each received a precise 20 mg dose of Guggul extract. In the ratios of 1:9, 2:8, 3:7, 4:6, 5:5, 6:3, 7:3, 8:2, and 9:1, DMSO and phosphate buffer, pH 5.4, solvent system was added, and the samples were shaken for an hour on a linear motion shaker (Model no. REMI RQ 123, Spectra Whirlmatic Lab, India). The answers' clarity was examined visually.

2.3. Analytical Methodology

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Using a UV/VIS spectrophotometer, the ultraviolet absorption spectrum of a Guggul extract solution in DMSO and a (8:2) mixture of DMSO and phosphate buffer pH 5.4 was measured over a wavelength range of 200 to 400 nm. Maximum absorption values (-max) were identified and subsequently utilised to plot the calibration curve.

2.3.1. Characterization of Oil, Surfactant and Co-Surfactant for Microemulsion [17,18]

2.3.1.1. Solubility

Various Oil, Surfactant, and Co-Surfactant Determination To choose the vehicle in which the medication is more soluble and suited for SEDDS formulation, a preformulation solubility analysis was conducted. It was determined how well the medication dissolved in various oils, surfactants, and cosurfactants, and the solvents for the study were chosen based on this. In the current investigation, the drug's solubility in several oils, including soyabean, olive, and Capryol 90, as well as in surfactants and cosurfactants, including Labrasol, Cremophor EL and PEG, Propylene glycol, was studied. Each vehicle received an excessive amount of the medication, which was then vortexed for 30 seconds (Remi mixer, Mumbai). At 30°C, the mixtures were shaken for 48 hours before reaching equilibrium for 24 hours. The insoluble drug was then removed from the equilibrated samples by centrifuging them at 1000 rpm for 10 min, and the clear supernatant liquid was decanted. After diluting a portion of the supernatant with DMSO, the drug's solubility was calculated using UV spectroscopy at 328 nm.

2.3.1.2. Screening of oils and surfactant

The tendency for quick emulsification and solubility in extract were used to choose the oils and surfactants. Capryl 90, olive oil, and soyabean oil were the oils chosen for this experiment. Cremophor RH-40, Labrasol, and Cremophor EL were the surfactants chosen. A 1:1 mixture of the oils and surfactant was used. In a nutshell, 150 mg of the oily phase were combined with 150 mg of the surfactants. Each mixture (100 mg) was then diluted to 100 ml in a stoppered conical flask with distilled water. The number of offlask inversions necessary to produce a homogenous emulsion was used to measure the ease of emulsification. Emulsions were let to stand for two hours, after which their % transmittance at 638 nm was measured using pure water as a blank. Additionally, the visual appearance of emulsions was checked for any turbidity or phase separation.

2.3.1.3. Preliminary screening of co-surfactants

The different co-surfactants (Propylene glycol, PEG 400, and Tanscutol) were further screened for their capacity to emulsify using the chosen oily phase and surfactant. Preliminary screening of surfactants describes how to make and analyse mixtures of 200 mg of cosurfactant, 400 mg of selected surfactant, and 600 mg of screened oil.

2.3.1.4. Pseudo Ternary Phase Diagram

The solubility information shown in Table was used to choose Capryol as the oil, Labrasol as the surfactant, and PEG-400 as the co-surfactant. In a pseudo-three-component phase diagram, the aqueous phase, the oil phase, and the mixing of surfactant and co-surfactant at set weight ratios (Smix ratio) are each represented by an axis. The water titration method was used to create pseudoternary phase diagrams for water, oil, and surfactant/cosurfactant. Each group received a different weight ratio (1:1, 1:2, 1:3, 1:4, 2:1, 3:1, 4:1) of surfactant and co-

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surfactant (Smix). For each phase diagram, oil and a certain Smix ratio were thoroughly combined in various weight ratios in various glass vials. For the investigation, various combinations of oils and Smix were created to precisely define the phase boundaries formed in the phase diagrams. The oil and Smix mixes were diluted with water drop by drop while being constantly stirred on six-station magnetic stirrers to produce a homogenous dispersion or solution. The point at which the solution became murky or turbid served as the titration's endpoint. the amount of watery phase necessary to produce turbidity.

2.4. Formulation of Self Emulsifying Drug Dosage Formulation [19, 20]

Gum guggul extract self-emulsifying drug dosage formulation was created by combining various amounts of oil, surfactant, and cosurfactant. The amount of guggul extract was kept constant throughout all of the formulations, but various amounts of oil, surfactant, and cosurfactant combination were also included. Permanent agitation was used to dissolve the necessary amount of gum guggul extract in the chosen oil at room temperature. A mixture of surfactant and co-surfactant was then added, and the mixture was gently stirred and sonicated. Then, with steady stirring, the proper amount of water was added to the mixture. Guggul extracts were successfully blended into a microemulsion when the mixture was stirred at room temperature. Table 1 lists the different formulation ratios (F1 to F8). The rate of self-emulsification and the appearance of the created emulsions were both visually observed during the procedure. The visual characteristics of Ternary triangular diagrams recorded against the increase of the applied surfactant component. According to computation, plotting points for favourable combinations were chosen.

Table 1: Guggul extract (SNEDDS) compositions (1–8). Capryol served as the oily phase, Labrasol or Cremophore served as the surfactant, and propylene glycol served as the cosurfactant. In every sample, there was 10 mg/mL of guggul extract

Compositions	**Formulation code**	**Capryol**	**Propylene Glycol**	**Cremophore EL**	**Labrasol**
Composition 1	F1	33 %	33 %	33 %	
Composition 2	F2	25 %		25%	
Composition 3	F3	20 %		20 %	
Composition 4	F4	25 %		50 %	
Composition 5	F5	33 %			33 %
Composition 6	F6	25 %			25 %
Composition 7	F7	15 %			15 %
Composition 8	F8	25 %			50 %

2.5. Evaluation of Formulation

Self-Emulsifying Drug Delivery System [19-25]

2.5.1. studies on the compatibility of drug excipients the physical, chemical, and biological properties of the medication and the excipients used in the production of the product must be taken into account in the design and formulation of the dosage form. To create a stable, effective, visually appealing, and secure product, compatibility between the active component and other excipients must be established. Compatibility tests are crucial if the excipients are

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brand-new and if there is no prior literature on using those specific excipients with an active ingredient. Covalent bonds are related to infrared (IR), and the spectrum's precise descriptions of molecular structure. Therefore, before creating the real formulation, the Fourier transform infrared (FT-IR) spectroscopy technique was used to verify NVP's compatibility with various polymers and other excipients. An effective analytical method for examining the chemical interactions between drugs and other excipients present in formulations is Fourier transform infrared spectroscopy. The interaction between the drug and the anticipated excipients was investigated using FT-IR. Dry powdered potassium bromide was thoroughly combined with the appropriate samples before being pulverised. The powdered combination was placed in a diffuse reflectance sampler, and the FT-IR spectrophotometer was used to scan in the wavelength range of 4000-400 cm1.

2.6. Drug content

In a little amount of methanol, a self-emulsifying drug delivery system formulation containing 100 mg of guggul extract was consumed. A 100 ml volume of DMSO solution (1 mg/ml) was created. 0.2 ml (200 g/ml) of the aforementioned stock solution was taken out and diluted up to 10 ml with methanol (20 g/ml). Samples were created in triplicate, and a UV-visible spectrophotometer was used to assess absorbance at 328 nm. The reference solution was DMSO.

2.7. Self-emulsification assessment

SMEDDF should instantly create a stable microemulsion in GI fluids after delivery. By dispersing the SMEDDF in 250 mL of water with magnetic stirring at 100 rpm to induce moderate turbulence that mimics in vivo conditions and assessing visually, the effectiveness of the chosen combination of surfactant and co-surfactant in self microemulsification was determined.

2**.8. Determination of droplet size and zeta potential**

Zeta potential measurements were used to determine the charge of the droplets. Zeta potential aids in emulsion system stability and flocculation effect prediction. If the zeta potential drops below a particular level, the colloid will gather due to attraction forces. Using Zetasizer (Nano ZS 90, Malvern Instruments, UK), the size of the produced emulsion's droplets and its zeta potential were calculated. At 25°C, a 90°angle was used to observe light scattering. Technique for in vitro dissolution (2.9) The USP type II dissolving apparatus is used in the quantitative in vitro dissolution investigations to evaluate the drug release from the oil phase into the aqueous phase. The temperature is maintained at 37 C0.5 C. At regular intervals of time (5, 10, 15, 30, 60 min), aliquots of 5 ml samples were taken out, and the volume was immediately refilled with fresh medium. The samples were then examined using a UV spectrophotometer set at 328 nm.

2.10. Evaluation of anti-hyperlipidemic effect of Optimized formulation [26-27]

2.10.1. Diet-induced hyperlipidemic model

The animals were chosen, weighed, and then given unique identification markings. Through oral administration of an atherogenic diet for 20 days, rats were rendered hyperlipidemic. The rats were then stomach intubated for 14 days while receiving plant extracts suspended in 2% acacia at a concentration of 200 mg/kg b.w. once daily in the morning. All of the groups continued to receive the same dosage of the atherogenic diet during these days. The

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hyperlipidemic meal and the vehicle were given to the control animals. The animals were utilised to measure several biochemical indicators at the conclusion of the treatment period. Under ether anaesthesia, a rat's heart was punctured to collect blood, which was then centrifuged for 30 minutes at 2000 rpm to get serum.

2.10.2. Triton-induced hyperlipidemic model

Animals that had been fasted for 18 hours received an intra-peritoneal injection of Triton (Triton x-100) saline solution at a concentration of 100 mg/kg b.w. The plant extracts were given orally by gastric intubation at a dose of 200mg/kg b.w. Following the injection of triton, the first dose was administered, followed by the second dose 20 hours later, continuing the extraction process for 7 days. Animals were employed for several biochemical markers after a 7-day treatment. Under ether anaesthesia, a rat's heart was punctured to collect blood, which was then centrifuged for 30 minutes at 2000 rpm to get serum.

2.10.3. Collection of blood samples

Serial blood samples (0.2 ml) were taken every 15 and 24 hours through retro-orbital puncture. The serum was separated by centrifugation following a 30-minute period of letting the blood clot at room temperature. Then, serum was tested to determine biochemical characteristics such as triglycerides, transaminases (AST and ALT), total bilirubin, creatinine, albumin, and blood urea nitrogen.

2.10.4. Accelerated Stability Studies

The glass vial containing the optimised formulation SEDDS was filled, sealed with a rubber lid, and crimped in preparation for storage in the stability chamber. According to ICH standards, samples were tested for six months for stability at 40°C, 2°C, and 5% RH, respectively. The chosen formulations' changes in droplet size, zeta potential, ability to self-emulsify, and drug content were all examined [28].

3. RESULTS AND DISCUSSION

3.1. Molecular Profile Table 2 presents the solubility of powdered extract of gum guggul in various solvents. Table shows that gum guggul is soluble in DMSO, hence DMSO was chosen for future research.

Table 2: Solubility Profile of Gum guggul extract

Solvent	**Solubility**
Distilled Water	Insoluble
Methanol	Sparingly Soluble
Ethanol	Sparingly Soluble
Acetone	Sparingly Soluble
Chloroform	Sparingly Soluble
Phosphate Buffer (5.4 pH)	Sparingly Soluble
DMSO	Soluble

3.2. Analytical Methodology UV-Visible Spectroscopy

Gum guggul extract in DMSO was reported to have a Lamda max (-max) of 328 nm.

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3.3. Characterization of Oil, Surfactant and Co-Surfactant

3.3.1. Selection of Excipients

Labrasol and Cremophor EL were the surfactants we used for this study. Rarely is a single surfactant sufficient to produce transient negative interfacial tension and fluid interfacial film; often, a co surfactant is required. Because co-surfactant is present, the bending force at the interface is reduced, and the interfacial film has the flexibility it needs to adopt the many curvatures needed to create microemulsions with a variety of compositions. Propylene glycol, which has an HLB value of 5–6, was chosen as the co-surfactant for the investigation as a result. Based on their effectiveness in emulsification and capacity to solubilize guggul extract, the surfactants and co-surfactants were chosen (Table 3).

Table 3: Solubility Determination of Gum guggul in Various Oil, Surfactant and Co-surfactant

Solvent		**Solubility (µg/ml) in gum guggul**
OILS	Olive Oil	24.1
	Capryol 90	65.4
	Soyabean Oil	32.5
Surfactant	Cremophor EL	71.23
	Labrasol	74.4
	CremophorRH-40	70.4
Co-surfactant	Propylene Glycol	56.2
	PEG 400	38.9
	Transcutol P	40.3

3.3.2. Pseudo-Ternary Phase Diagram

Phase diagrams of systems containing Capryol as an oil phase, Labrasol& Cremophor EL as a surfactant, and Propylene glycol as a co-surfactant were created at the surfactant/co-surfactant (Smax) ratios of 1:3, 1:2, 1:1, and 2:1 (w/w) to ascertain the presence of a microemulsion zone. The phase analysis showed that when compared to the other ternary plots, the acquired microemulsion region of composition 8 Smax ratios was low, while composition 3 Smax ratios had the largest microemulsion region. Study of ternary phase diagrams revealed an increase in the microemulsion areas gradually as concentration of co-surfactant increased; this suggests that the co-surfactant has some impact on the ability to create micro emulsion. Comparing the composition 3 ratio of Smax to all other ternary plots revealed the maximum microemulsion region, indicating that an increase in surfactant concentration produces the highest microemulsion regions of any ternary plot. It suggests that the ability of SEDDF to produce microemulsion regions is significantly influenced by the concentration of surfactant (fig.1).

3.3.3. Drug content

The produced guggul extract SEDDS was subjected to UV-visible spectrophotometer analysis. At 328 nm, a linear calibration curve was established in the (2- 10 g/ml) range with

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an R2 correlation coefficient of 0.998. All SEDDS formulations'% drug content was confirmed to be within the allowable ranges of the drug content test. The Assay findings are displayed in table no.4.

3.3.4. Standard calibration curve

Plotting absorbance vs. concentration at 328 nm yielded the Commiphoramukul extract's standard calibration curve, which follows Beer's law. Table 5 and Fig. 2 contain the findings.

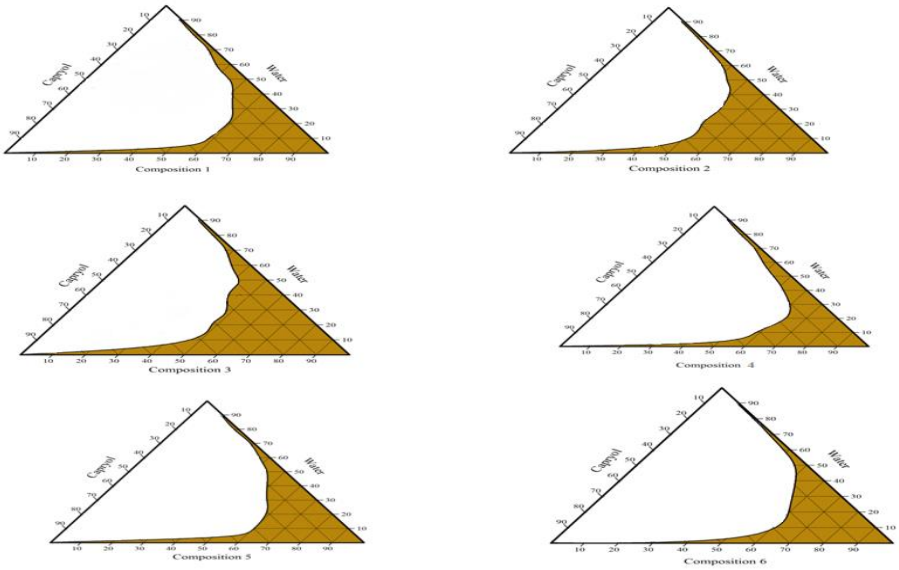

Table 4: Drug Content of SEDDF formulation with guggul extract

Formulation	Percentage of Drug contents (X±SD)
F1	97.3±2.8
F2	98.6±0.6
F3	99.3±0.8
F4	97.4±97
F5	98.6±0.8
F6	98.6±0.8
F7	98.9±1.4
F8	96.5±1.9

SD = Standard deviation

3.3.5. Determination of self-emulsification time

Emulsification time is a crucial metric for determining how effectively emulsions are formed. When SEDDF are treated to water dilution while being lightly stirred, they should disperse quickly and fully. Due to peristaltic activity, the formulation should disperse fast when subjected to water dilution while the GIT is being gently agitated. All formulations' emulsification times were listed in Table. The F3 formulation had the shortest emulsification

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time of 58 seconds, while the F8 formulation had the longest emulsification time of 170 seconds. Following observation, it was discovered that the F3 formulation produces microemulsion more quickly than all other formulations, proving that it was the best of all developed formulations.

Table 5: Standard calibration curve of Commiphoramukul at 328 nm

Concentration (µg/ml)	**Concentration (µg/ml)**
0	0.000
2	0.097
4	0.189
6	0.239
8	0.343
10	0.396

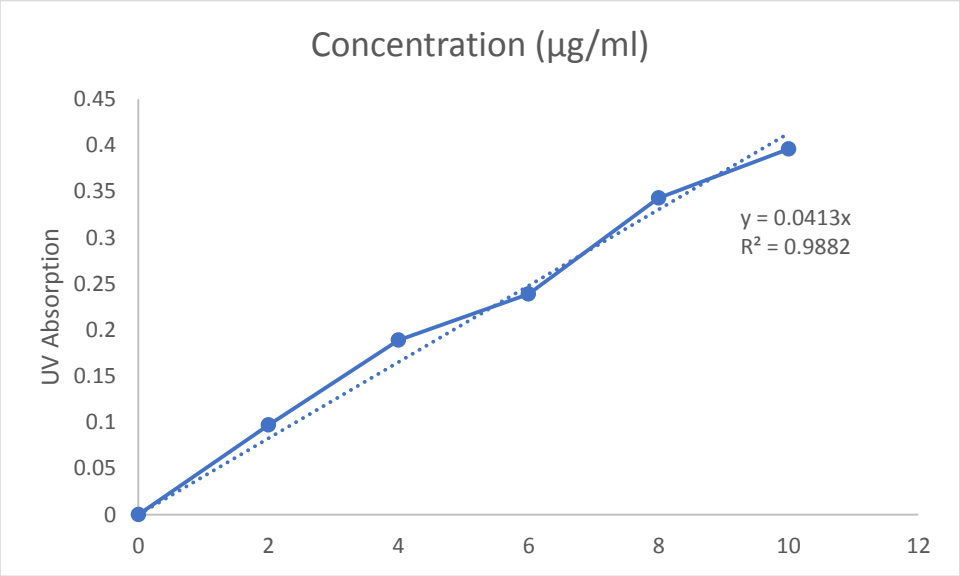

Fig. 2: Standard calibration curve of Commiphoramukul at 328 nm

Table 6: Self Emulsification time of SEDDF formulation

Formulation	**Self-Emulsification Time**
F1	96 ±1.9
F2	67 ±0.5
F3	58 ±0.7
F4	120 ±2.9
F5	98 ±0.8
F6	97 ± 5.7
F7	62 ±1.4
F8	170±2.5

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3.3.6. Droplet size analysis

The size of the emulsion's droplets affects how much and how quickly the medication is released, as well as absorption. With increasing droplet size, more surface area at the interface is available for medicine absorption. The size of the emulsion's droplets and the amount of surfactant being used are connected. Raising the surfactant content can occasionally lead to smaller mean droplet sizes. This may be due to a concentration of surfactant molecules stabilising the oil droplets at the oil-water interface. However, in some instances, when surfactant concentrations increase, the mean droplet size may increase. The origin of this phenomenon might be the interfacial disruption brought on by increased water penetration into the oil droplets, which is mediated by the increased surfactant concentration and results in oil droplet ejection into the aqueous phase. The droplet sizes for the formulations are listed in Table. It was shown that as the concentration of surfactant and cosurfactant increased, the droplet size decreased. The greater availability of surfactant may have made the oil-water interface more stable. The Smax mixture's decreased flowability, however, was brought on by a larger surfactant concentration. The smallest droplet size, according to Formulation F3, is 190.8 nm.

3.3.7. Determination of Zeta potential

The stability of the emulsion is directly influenced by the magnitude of the surface charge. Zeta potential is significant because the stability of colloidal dispersions can be correlated with its value. For small molecules and particles, a high zeta potential signifies stability, which means the system will be resistant to aggregation. Low zeta potential results in an imbalance between the attracting and repellent forces, which leads to flocculation and system failure. Numerous investigations have suggested that the zeta potential was important for the interaction of the mucus of the gastrointestinal system with other substances. The results imply that positively charged droplets may interact more favourably with gastrointestinal mucus because the interior of intestinal cells has negative charges when mucosal fluid is present. Zeta potential values for the formulations are shown in Table. The formulas' positive zeta potential values differ. The F3 formulation has the highest zeta potential, 16.2 mV.

Table 7: Droplet size and zeta potential of formulation

Formulation Code	Droplet size (nm)	Zeta potential (mV)
F3	190.9 nm	16.3 mV
F7	215.4 nm	13.4 mV

3.4. In vitro dissolution study

The pure extract release from the produced guggul extract SEDDF formulations was compared using an in vitro dissolving technique. Drug release from the oil phase into the aqueous phase is evaluated using quantitative in vitro dissolution tests using USP type II dissolution apparatus. Table 8 and Fig. 3 contain a list of the outcomes of in vitro dissolving experiments. After analysing the data, it was discovered that the guggul SEDDF F3 formulation released nearly 98.14% of the drug within 60 minutes, as opposed to the other formulations, which released 68.45%, 85.21%, 58.81%, 63.45%, 79.81, 89.56%, and 52.45%

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of the drug, respectively. As a result, it was discovered that the drug release from the guggul SEDDF F3 formulation was much higher than that from the other SEDDS formulations and pure extract. It might be proposed

Table 8: In-vitro drug release profile of SEDDF formulation

Time in Minutes	F1	F2	F3	F4	F5	F6	F7	F8
0	0	0	0	0	0	0	0	0
5	22.64	22.64	32.86	18.46	19.38	22.73	29.41	15.46
10	39.33	40.89	52.46	31.99	34.83	36.65	39.68	25.62
15	44.24	50.88	54.44	40.42	41.33	49.75	50.17	33.57
30	53.84	63.69	72.69	48.55	49.38	60.49	66.36	43.55
45	62.26	74.46	88.46	53.58	59.62	69.96	78.69	48.88
60	68.46	85.22	98.15	58.82	63.46	79.82	89.57	52.44

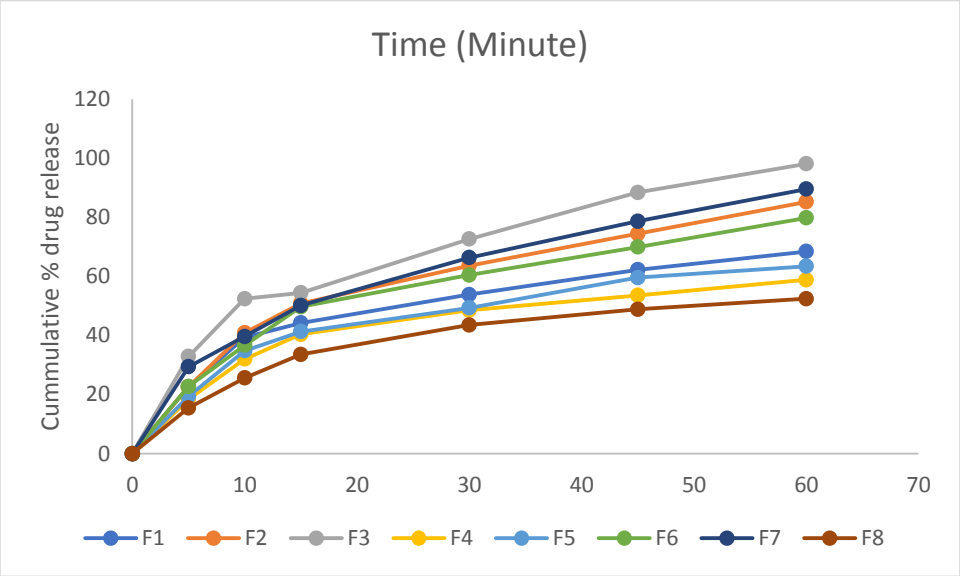

Fig. 3: In-vitro drug release profile of SEDDF formulation

3.5. Transmission electron microscope (TEM)

SMEDDF was diluted, and the resulting droplets were observed under high magnification and demonstrated. The size of the observed spherical droplets confirmed the dynamic light scattering data.

3.6. Pharmacological Screening

As previously reported, injection of a high-fat diet with Triton X-100 (100 mg/kg) successfully produced hyperlipidemia in rats by raising the serum concentrations of TC, TG, and LDLC. Tables 9 and 10 illustrate how serum lipid profile levels were affected by CommiphoraWightii methanolic extract. When compared to the hyperlipidemic control group, administration of formulation F-3 at doses of 250 mg/kg significantly decreased the serum levels of TC, TG, and LDLC and improved the levels of HDL-C. Comparable to the group of rats treated with fenofibrate, the change in lipid levels in groups II, III, and IV. one

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of two fractions much lower than the other the increased lipid levels. As a result, the research demonstrated that CommiphoraWightii, when administered at a dose level of 250 mg/kg, was effective as a hypolipidemic drug. In order to assess the active constituents responsible for the activity and mechanisms of these effects, additional research would be required. The active ingredient found in plants may recover the problems in lipid metabolism shown in a hyperlipidemic state.

Model-I High Fat Diet Induced Hyperlipidemia

Table 9: Effect of SEDDF formulation of Methanolic extract of CommiphoraWightii on serum biochemical parameters in cafeteria fed diet rats.

Sr. No	Groups	Cholesterol (mg %)	TGS (mg %)	HDL (mg %)	LDL (mg %)	VLDL (mg %)
1	Normal Control (2% CMC)	130.8	70.06	50.78	62.19	13.02
2	High fat cafeteria diet	148.9	96.54	20.44	109.3	18.11
3	Cafeteria diet + Fenofibrate (65mg/kg/p.o.)	115.3	55.98	32.99	84.4	4.96
4	Cafeteria diet + Mtoh extract (250mg/kg/p.o.)	135.9	60.01	34.58	90.01	13.9
5	Cafeteria diet +Mtoh extract (500mg/kg/p.o.)	128.5	70.82	36.59	87.48	12.37

Data are shown as mean SEM, with n = 6 (number of six animals) in each group. One-way ANOVA followed by the Tukey multiple comparison test was used to compare various groups. A substantial difference from the vehicle-treated groups, a significant difference from the high-fat diet groups, a significant difference from the standard drug-treated groups, and a significant difference from the test drug-treated groups.

Model-II Triton Induced Hyperlipidemia

Table 10: Effect of SEDDF Formulation of Methanolic extract of CommiphoraWightii on serum biochemical parameters in Triton induced hyperlipidemia in rat.

Sr. No	**GROUP**	**Cholesterol (mg %)**	**TG (mg %)**	**HDL (mg %)**	**LDL (mg %)**	**VLDL (mg %)**
	Normal Control (2% CMC)	110.35	90.16	45.35	46.98	18.04

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2	Triton Control	152.52	153.25	27.66	94.22	30.63
3	Triton + Fenofibrate (65mg/kg/p.o.)	120.16	90.45	55.85	46.27	18.06
4	Triton + Mtoh extract (250 mg/kg/p.o.)	140.27	120.38	45.57	69.24	23.48
5	Triton + Mtoh extract (500 mg/kg/p.o.)	130.11	110.56	50.23	60.97	20.93

Data are reported as mean SEM, with n = 6 (number of six animals) in each group. Tukey multiple comparison test is used to evaluate the results of several groups using one-way ANOVA, and the result is p 0.001. a indicates a significant difference in comparison to the vehicle-treated groups, b indicates a significant difference in comparison to the high-fat diet groups, c indicates a significant difference in comparison to the standard drug-treated groups, and d indicates a significant difference in comparison to the test drug-treated groups.

Table 11: Stability studies of Formulation

Formulation Code	**Droplet size (nm)**	**Zeta potential (mV)**	**Self-emulsification time (min)**	**Drug contents**
	190.8 nm	16.2 mV	194.5nm	98.24
	215.3 nm	13.4 mV	12.83mV	97.82

3.7. Stability studies

At regular intervals, samples from the stability chamber were removed and tested for self-emulsification effectiveness, droplet size, and zeta potential readings. Table displayed the results. The zeta potential, self-emulsification capacity, and droplet size did not vary much. Initial samples show a stable dispersion of SMEDDF with smaller droplet sizes.

4. CONCLUSION

The findings show that effective SEDDF formulations of CommiphoraWightii methanolic extracts and SEDDF formulation at doses of 250 mg/kg considerably decreased the blood TC, TG, and LDLC levels and improved the serum HDL-C levels, showing promising outcomes. When compared to the hyperlipidemic control group, the effect of the ethanolic extract formulation SEDDF of CommiphoraWightii at doses of 250 mg/kg dramatically decreased

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the serum TC, TG, and LDLC levels and improved the serum HDL-C levels. The lipid level changes in groups II, III, and IV were equivalent to those in the rat group receiving fenofibrate treatment. The study demonstrated that CommiphoraWightii, when administered at a dose level of 250 mg/kg, was effective as a hypolipidemic drug. Further investigation would be required to determine the active constituents responsible for the activity and mechanisms of these effects in order to recover the problems in lipid metabolism shown in hyperlipidemic condition from the active ingredient found in plants. At a dose of 250 mg/kg, the CommiphoraWightii indicated protective effect and showed a significant reduction in the elevated diet-induced levels of blood TC, LDL-C, and triglycerides. Effects were equivalent to those of the common medication fenofibrate at a dose of 250mg/kg.

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