ORIGINAL ARTICLE

Lipid-Based Pastillation: A Promising Strategy to Enhance Solubility and Bioavailability of Rosuvastatin Calcium

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Abstract

Objectives: Rosuvastatin calcium, a Biopharmaceutics Classification System (BCS) Class II drug used to manage various conditions, is known for its low solubility, which results in slow dissolution and reduced bioavailability. This study focused on developing an advanced method to enhance its solubility. One of the latest and most innovative approaches for improving a substance's solubility, dissolution rate, and consequently its bioavailability is pastillation. **Materials and Methods:** Rosuvastatin calcium pastilles were prepared using a laboratory-scale pastillation technique and optimized through a 3^2 factorial design. Formulations were evaluated for practical yield, drug content, dissolution behavior, Fourier transform infrared (FTIR) compatibility, differential scanning calorimetry, X-ray diffraction, scanning electron microscopy, and accelerated stability studies. All experiments were performed in triplicate ($n = 3$). **Results:** Pastilles of Rosuvastatin calcium were manufactured using Gelucire 50/13 and polyethylene glycol (PEG) 6000, following the selection of the polymer based on solubility tests. After the production was validated by FT-IR analysis, the pastilles were evaluated for their yield, solubility, drug content, and dissolution performance. **Conclusion:** Rosuvastatin calcium pastilles were created with Gelucire 50/13 and PEG 6000, selected based on solubility assessments. Following validation of their production through FT-IR analysis, the pastilles were examined for yield, drug content, solubility, and dissolution characteristics.

Key words: Antihyperlipidemic, Gelucire 50/13, Pastille formulation, Rosuvastatin calcium

INTRODUCTION

Oral administration is the most practical and widely used drug delivery method due to its simplicity, high patient adherence, cost-efficiency, and adaptability in dosage form design. The effectiveness of this method hinges on achieving the appropriate drug concentration in the bloodstream to elicit a pharmacological response, which is significantly influenced by the drug's solubility. For drugs with poor water solubility, such as Rosuvastatin calcium, reaching a therapeutic plasma concentration often necessitates a higher dosage. Low bioavailability can result from inadequate solubility and sluggish dissolution rates in gastrointestinal fluids, particularly for BCS Class II medications such as calcium Rosuvastatin. Improving the solubility and dissolution rate in stomach fluids can enhance the drug's bioavailability. Solubility is generally the limiting factor for BCS class II drugs.[1-4]

Using the pastillation process, a solid dispersion of the medication and polymer is produced. After being heated with a coil inside a glass syringe, this liquid is dropped onto a metal plate fitted with a cooling mechanism, where it hardens

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into pastilles.The lipid-based formation as pastilles improves the BCS Class II medicines solubility, rate of dissolution, and bioavailability. These pastilles are created from lipids that melt and then resolidify, making them ideal for the pastillation process.[5-7] This method produces distinct, solid chunks of the drug. Lipid-based formulations are gaining attention as an innovative dosage form due to the versatile structural properties of lipid excipients. The equipment used for this process is commonly referred to as a droplet solidification device.[8,9]

In this study, the issue of low aqueous solubility was addressed by creating a pastille of Rosuvastatin calcium using an appropriate polymer. Pastillation are innovative method for solubility enhancement of crystalline drugs. The study will focus on optimizing the pastillation process to create solid dispersions of rosuvastatin calcium with lipid excipients, improving its solubility and dissolution rate in gastrointestinal fluids. This enhancement is expected to produce stable solid pastilles that effectively increase the drug's therapeutic efficacy by achieving higher plasma concentrations with lower dosages.

Although numerous approaches, such as solid dispersions, lipid-based carriers, self-emulsifying systems, and nanocarriers, have been investigated to improve the solubility of Rosuvastatin calcium, limited studies have explored lipid-based pastillation technology for this purpose. Furthermore, information regarding the influence of Gelucire 50/13 and polyethylene glycol (PEG) 6000 on the physicochemical properties and dissolution performance of Rosuvastatin calcium pastilles remains scarce. Therefore, the present study was designed to develop and optimize Rosuvastatin calcium pastilles using lipid-based excipients and evaluate their potential for improving dissolution performance process to create solid dispersions of rosuvastatin calcium with lipid excipients, improving its solubility and dissolution rate in gastrointestinal fluids. This enhancement is expected to produce stable solid pastilles that effectively increase the drug's therapeutic efficacy by achieving higher plasma concentrations with lower dosages.

MATERIALS AND METHODS

Materials

Rosuvastatin calcium was provided by Glenmark, Nashik. Gelucire 50/13, Aerosil, and methanol were sourced from Research-Lab Fine Chem Industries, Mumbai. PEG 6000 was obtained from modern industries.[8]

Methods

The procedure begins by combining Rosuvastatin calcium, PEG 6000, and Gelucire 50/13 in a metallic syringe. The syringe is then heated to create a homogeneous solid dispersion of the mixture.[2,8] Once this dispersion is uniform, melted droplets are dispensed from the syringe's nozzle. These droplets are allowed to cool, forming pastilles of consistent size. The cooling process ensures proper solidification of the pastilles. Finally, the pastilles are collected from an ice plate, completing the process. This method effectively produces consistent and uniform pastilles from the initial pharmaceutical blend.[5,6,9]

Ultraviolet (UV) spectroscopy

To determine the maximum absorbance (λmax) of Rosuvastatin calcium, stock solutions were prepared in both phosphate buffer pH 6.8 and methanol. For phosphate buffer, a 100 µg/mL stock was diluted to 10–60 ppm, and UV spectra were scanned from 200 to 400 nm, with λmax recorded at 243 nm. For methanol, the process was similar, with a concentration range of 10–50 ppm. The solubility of rosuvastatin calcium was tested in various solvents (distilled water, methanol, PEG 6000, Gelucire 50/13, and phosphate buffer pH 6.8) by preparing saturated solutions, shaking them at 37°C for 72 h, and analyzing the supernatant using UV-visible spectrophotometry. Polymer selection for preparation involved assessing melting behavior with Gelucire 43/01, Gelucire 50/13, Polyvinylpyrrolidone, and Eudragit, determining the polymer quantity needed to achieve a clear solution with continuous stirring and heating.[10-12]

Solubility study of rosuvastatin calcium

Saturation solubility tests were conducted on pure Rosuvastatin calcium using methanol, Ethanol, Phosphate buffer PH 6.8, and Water. Rosuvastatin calcium was added to 10 mL vials containing each of these solvents.[1,13] The vials were then placed in a rotary shaker at 37°C for 72 h. After this period, the supernatant solutions were carefully collected and filtered through membrane filters (0.45 µm). The concentration of Rosuvastatin calcium in the filtered solutions was determined using UV-visible spectroscopy.[14,15]

Fourier transform infrared (FTIR) analysis

Infra-red spectroscopic analysis FTIR Spectrophotometer (PerkinElmer, spectrumtwo) was used for Infra-red spectroscopic analysis with a resolution in the range of 4000-450 cm^{-1}

Interaction study of drug with polymer

FT-IR was utilized to examine the interactions between Rosuvastatin calcium and various polymers using diffuse reflectance spectroscopy.[1,2]

FT-IR

The samples were scanned in the range of 4000 to 400 cm^{-1} to analyze their interactions with the polymers. The spectra of the pure drug, the polymers, and the pastilles were interpreted and compared to identify any potential chemical interactions.

Preparation of pastilles

Gelucire 50/13, PEG 6000, and Rosuvastatin calcium were mixed and introduced into a lab-scale pastillation device equipped with a metal syringe. The device's heating coil, regulated by a temperature controller, heated the mixture. As the molten mass was heated, it was allowed to dripped onto a plate with a cooling system. The hot drops solidified upon cooling, forming pastilles. The resulting Rosuvastatin calcium pastilles are illustrated in Figure 2. After solidification, the pastilles were scraped off the ice plate and prepared for use.[5,7]

Optimization of pastilles

A 3^2 full factorial design was used to explore the effects of two independent variables, each set at three different levels. The factors studied were Gelucire 50/13 and PEG 6000. Based on this design, the design expert software proposed nine model formulations. The maximum and minimum levels for these variables are detailed in Table 1.[10] Analysis of variance (ANOVA) was performed to characterize the statistical significance of the independent variables and their interaction effects. Polynomial equations were generated for the responses.[16] The statistical and mathematical analyses were conducted using Design Expert software (version 13.0.0). The design and actual variable values suggested by the software for the full factorial design (2 factors, 3 levels) are shown in Table 1.[5,17]

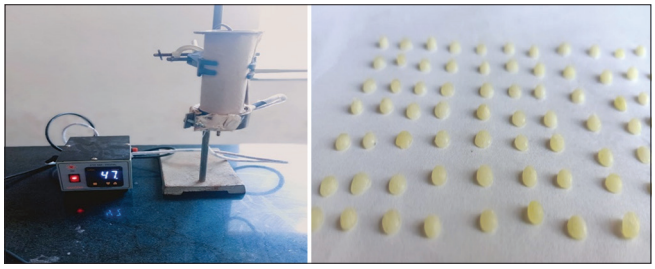

Figure 1: Lab scale pastillation assembly and pastilles

Practical yield

The theoretical yield was calculated by as the total combined amount of Rosuvastatin calcium, PEG 6000, and Gelucire 50/13. The practical yield was the actual number of pastilles produced after completing the pastillation process.[18] To evaluate the effectiveness of the method, the practical yield was calculated using the following formula:

$$\text{Practical yield}\,(\%)=\frac{\text{Practical yield}}{\text{Theoretical yield}}\times 100\%$$

This calculation helps assess the efficiency of the pastillation method.[7,17]

Drug content

Using a mortar and pestle, the pastilles were pulverized for the drug content examination. After the powder had been triturated, 100 mL of methanol was put to a volumetric flask. After that, the mixture was sonicated for 10 min, shaking intermittently, in an ultrasonic water bath. A UV spectrophotometer was used to evaluate the solution for Rosuvastatin calcium at a wavelength of 243 nm after filtering it through 0.45µm filter and diluting it with methanol

Table 1: Design batches of pastilles

S. No	Gelucire 50/13 (mg)	Polyethylene glycol 6000 (mg)	Rosuvastatin calcium (mg)
1	475	450	10
2	600	300	10
3	475	300	10
4	475	600	10
5	600	600	10
6	350	450	10
7	600	450	10
8	350	600	10
9	350	300	10

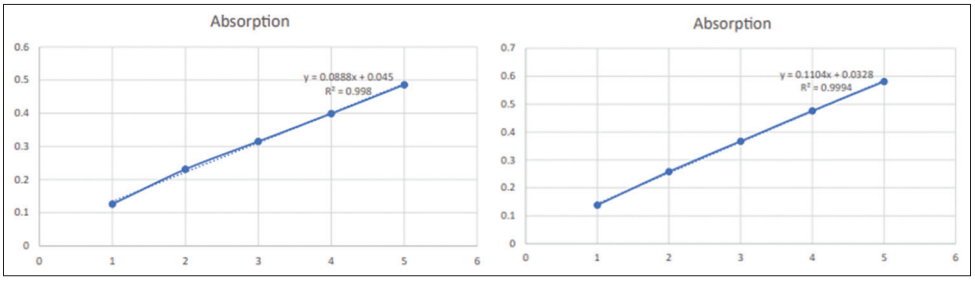

Figure 2: Standard calibration curve in phosphate buffer pH 6.8, and methanol

if needed. To account for any interference from excipients, a blank solution was prepared by treating placebo batches in the same manner as the actual samples.[5,15]

Dissolution test of pastilles

To assess changes in the dissolution rate of the medication following pastillation, an *in vitro* release study of the pastilles was performed. A single dose of Rosuvastatin calcium pastille was weighed and wrapped in muslin cloth. The dissolution was conducted using a USP type-II dissolution apparatus (EDT-08L, Electrolab, India) with 900 mL of Phosphate buffer at pH 6.8. The apparatus operated at 50 rpm and 37.5°C for 90 min. Five milliliter samples were taken out of the sink on a regular basis and replaced with the equal volume of hot dissolving media to maintain sink conditions. After passing through 0.45 µm Whatman filter paper, the samples were examined at 243 nm with a UV spectrophotometer.[6,14,20]

Differential scanning calorimetry (DSC)

DSC was used to analyse pure Rosuvastatin calcium, pure polymer, and drug-polymer pastilles to understand changes during pastille formation and to enhance drug solubility. DSC was conducted with a DSC-60 Plus (SHIMADZU), calibrating with Indium and Lead, heating samples from 30 to 400°C at 10°C/min in a nitrogen atmosphere.[1,19,21]

X-ray diffraction (XRD)

XRD analyses were performed on both the pure drug and the optimized pastilles to assess changes in crystallinity resulting from the drug-polymer mixture. A comprehensive XRD study was performed using a Philips analytical X-ray diffractometer (Model: PW3711, The Netherlands).[1,14,22]

Scanning electron microscopy (SEM) studies

The pastilles that showed the best results in solubility and dissolving tests were subjected to SEM investigations. The purpose of these investigations was to verify any structural alterations that were place during pastille development. Before analysis, samples were made by using graphite glue to attach pastilles onto a brass stub, which were then vacuum-coated with gold. A SEM (FEI, Netherlands, Quanta 200) was used to take pictures at the necessary magnification and acceleration voltage of 10 kV.[19,14]

Stability studies

Stability studies are essential for drug development and registration, assessing how a drug's quality changes over time under various conditions like temperature, humidity, and light. These studies help establish storage conditions, re-test periods, and shelf-life. Tablets were stored as per International Council for Harmonization (ICH) guidelines at 40°C ± 2°C and 75% RH ± 5% RH, and samples analyzed at 1–3 months.

RESULTS

UV visible spectrophotometric study

The prepared solution was scanned in the UV-visible spectrum from 4000 to 200 nm using a LABINDIA spectrophotometer [Figure 2]. A standard calibration curve for Rosuvastatin calcium was created in phosphate buffer at pH 6.8. The drug exhibited maximum absorption at 243 nm. The linearity was confirmed within a concentration range of 10–50 µg/mL, and the linearity graph in phosphate buffer had a regression coefficient of 0.998 [Figure 4].[23-27]

Standard calibration curve in methanol

A standard calibration curve for Rosuvastatin calcium was established in methanol, with the maximum absorption observed at a wavelength of 243 nm. Linearity was demonstrated across a concentration range of 10–50 µg/mL. The linearity plot in methanol yielded a straight line with a regression coefficient of 0.9994 [Figure 2].[28]

FT-IR

To assess the compatibility of Rosuvastatin calcium with the polymers PEG 6000 and Gelucire 50/13, an FT-IR study was conducted. The infrared spectra of Rosuvastatin calcium [Figure 6], the polymers PEG 6000 and Gelucire 50/13, and their combination [Figure 3] were analyzed using an FT-IR spectrometer (Bruker).[29]

Percentage yield

The prepared pastilles from the nine batches were weighed to determine the practical yield for each batch. It was found that the percentage yields ranged from 80.58% to 96.66%. The high production yields observed may be attributed to the ample presence of the polymer.[30]

Drug content

All nine batches of pastilles were assessed for drug content to ensure that each batch contained Rosuvastatin calcium in the correct proportion. The drug content varied between 88% and 96%.

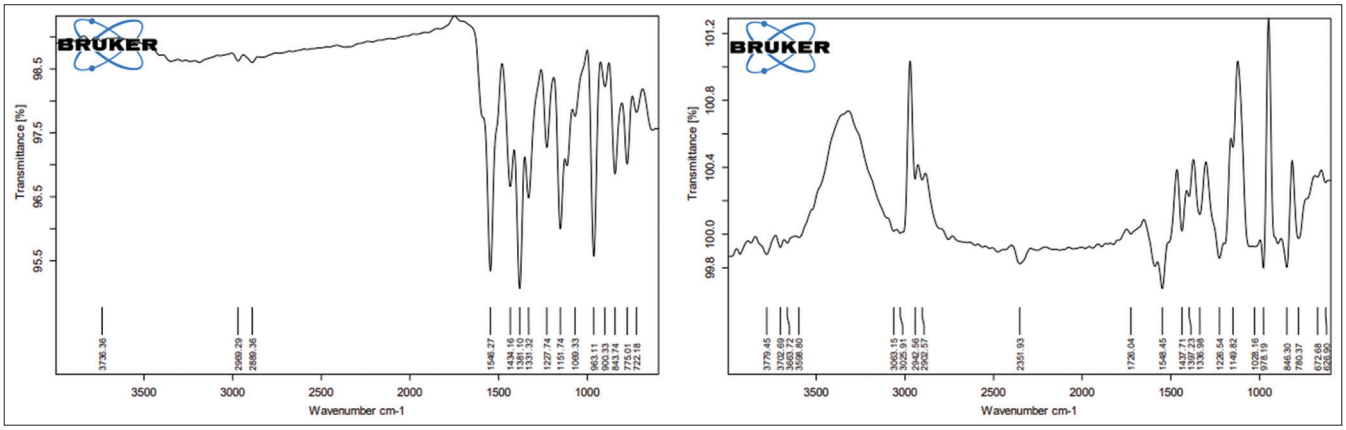

Figure 3: Infrared of rosuvastatin calcium and physical mixture (Drug+Gelucire 50/14+polyethylene glycol 6000)

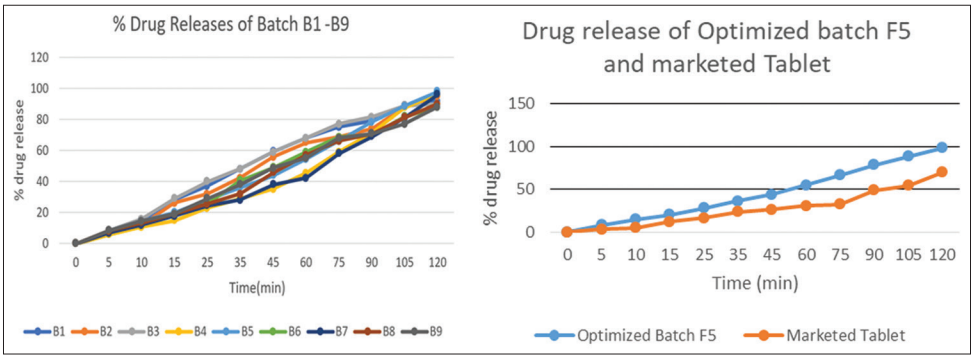

Figure 4: Graphical representation of drug release profile of batches B1–B9 and % drug release of optimized batch and marketed tablet

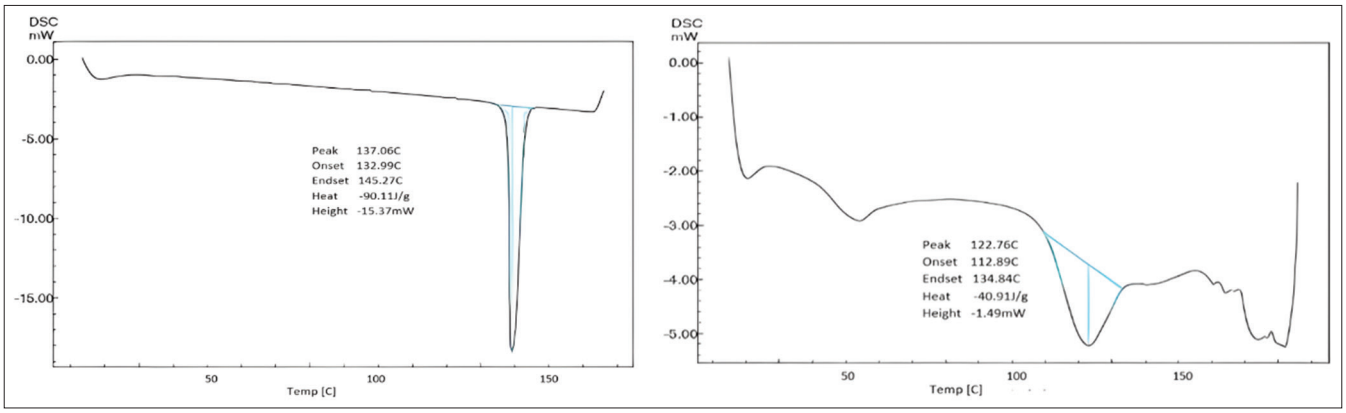

Figure 5: Differential scanning calorimetry thermogram of rosuvastatin calcium and DSC thermogram of pastilles

In vitro drug release

The *in vitro* drug release study for Rosuvastatin calcium pastilles was conducted over a period of 2 h using a phosphate buffer at pH 6.8 and a temperature of 37 ± 0.5°C. The dissolution profiles for formulations B1 through B9 indicated that batch B5 exhibited a superior drug release profile compared to the other batches. The cumulative percentage of drug release for all formulations is illustrated in the graph below. Notably, batch B3 also demonstrated a significant cumulative percentage of drug release.[31-34] The drug release profiles for all nine formulation batches are presented in Figure 4.

The dissolution profiles demonstrated that the pastillation process significantly improved the dissolution behavior of Rosuvastatin calcium. The optimized formulation (B5) exhibited the highest cumulative drug release among all batches, which may be attributed to improved wetting, enhanced drug dispersion within the lipid matrix, and partial conversion of the crystalline drug into an amorphous form. The presence of Gelucire 50/13 likely contributed to improved solubilization, while PEG 6000 enhanced wettability and dispersion of the drug particles.

Kinetic treatment to dissolution data

Several kinetic models, such as zero-order kinetics, first-order kinetics, the Higuchi model, and the Korsmeyer-Peppas model, were used to assess the dissolution data. Formulation F5 was determined to be the optimal batch based on the *in vitro* release profile, and its drug release kinetics were further investigated investigated in Table 3.[35-38] The dissolution data of the optimized batch were fitted to different kinetic models to determine the drug release mechanism. The Zero-order model showed the highest correlation coefficient (R^2 = 0.9828), followed by the Hixson–Crowell model (R^2 = 0.9800), First-order model (R^2 = 0.9763), Higuchi model (R^2 = 0.9678), and Korsmeyer–Peppas model (R^2 = 0.8889). These results indicate that the optimized formulation predominantly follows Zero-order drug release kinetics in Table 4.

DSC

Rosuvastatin calcium pastilles DSC curve showed a large peak at 137.06°C. The impact of the polymer on the pastilles is responsible for this drop in melting point. There was a minor variation when compared to the stated melting point. The polymer Gelucire is probably the cause of this change. The drug's shift from a crystalline to an amorphous state may be indicated by the large peak seen in the pastilles' DSC thermogram (DSC study in [Figure 5]).[39-41]

X-RD studies

X-ray diffractometry was performed on both pure Rosuvastatin calcium and the Rosuvastatin calcium pastilles. The diffractogram for the pure drug, shown in Figure 6, displayed peaks at 9.54, 14.66, 20.24, 21.18, 22.38, 29.0, 30.52, 36.72, and other positions, indicating the crystalline nature of the drug. In contrast, the diffractogram for the Rosuvastatin calcium pastilles exhibited only a single prominent peak at 20.7. This peak is attributed to the crystalline state of Gelucire 50/13 present in the pastilles. The absence of other distinct peaks in the X-ray diffractogram of the pastilles suggests that the Rosuvastatin calcium has transitioned from its crystalline form to an amorphous state.[42-44]

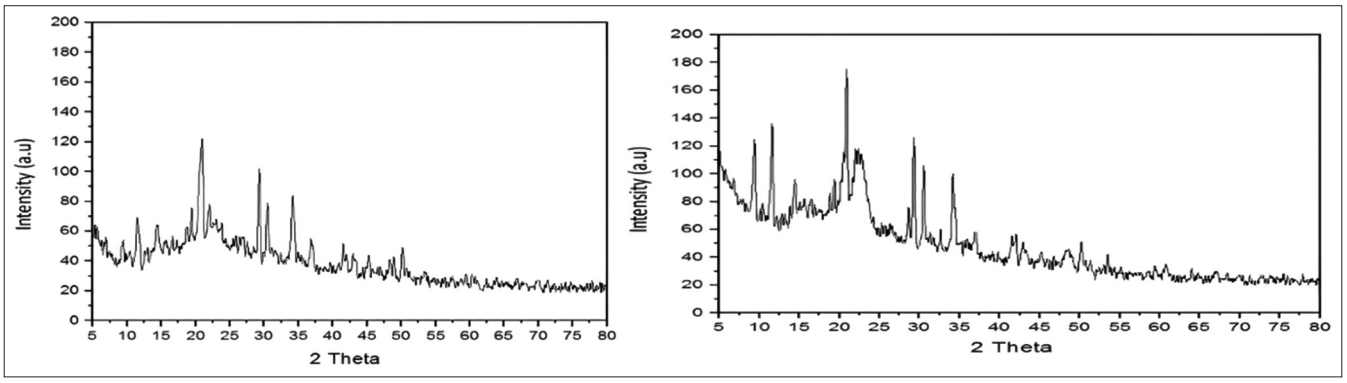

Figure 6: X-ray diffraction (XRD) of rosuvastatin calcium and XRD of optimized batch

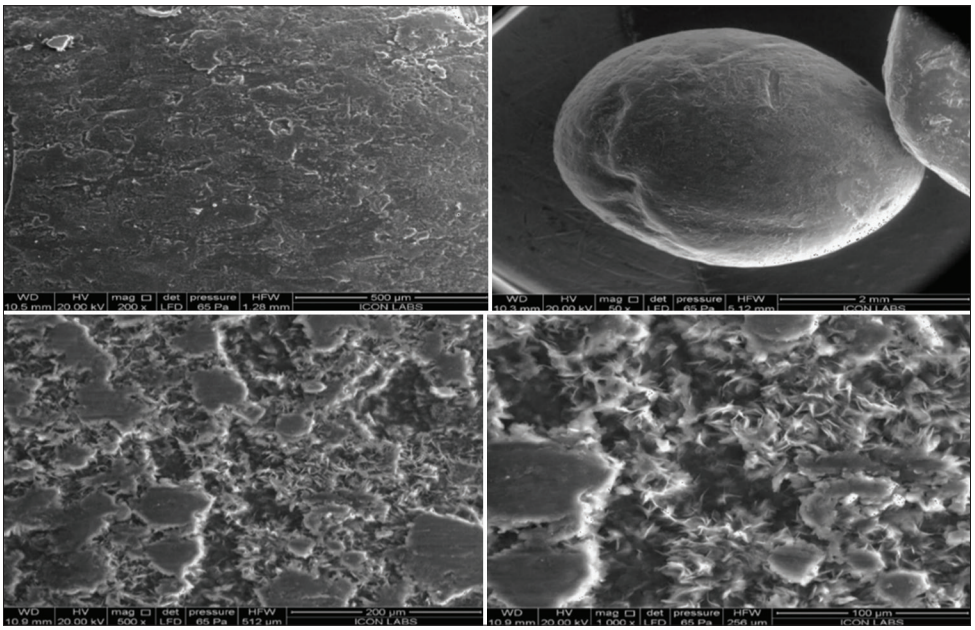

Figure 7: Scanning electron microscopy image of rosuvastatin calcium pastilles

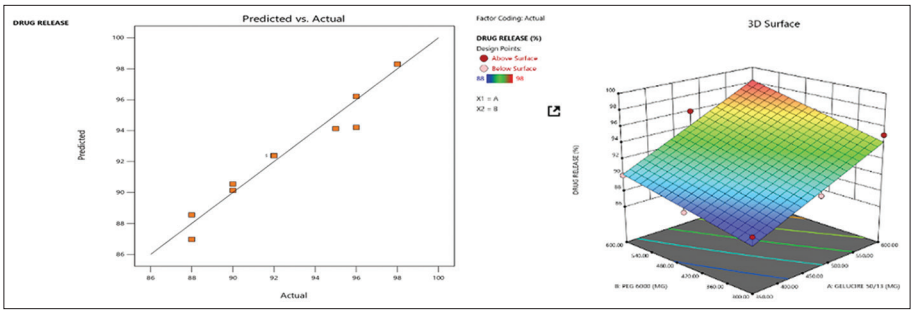

Figure 8: Predicted versus actual plot obtained of drug release and 3D surface plot drug release gelucire

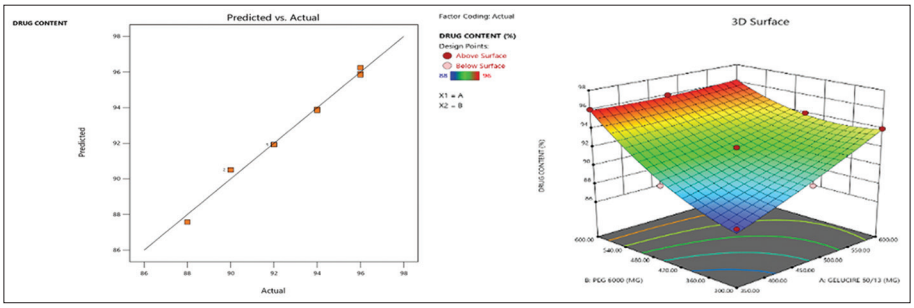

Figure 9: Predicted versus actual plot of drug content and 3D surface plot drug content gelucire

Table 2: *In vitro* dissolution of Rosuvastatin calcium pastilles B1–B9

	Percentage drug release of batches								
Time (min)	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**
0	0	0	0	0	0	0	0	0	0
5	6.02±0.10	8.02±0.33	8.46±0.35	5.73±0.13	8.04±0.25	7.43±0.14	6.90±0.13	8.29±0.12	8.35±0.14
10	14.13±0.12	12.03±0.16	15.90±0.29	10.87±0.12	14.56±0.19	13.45±0.26	12.17±0.32	13.54±0.32	14.52±0.34
15	28.31±0.13	26.22±0.35	29.03±0.14	15.00±0.35	20.04±0.16	19.23±0.15	17.86±0.22	19.14±0.23	19.03±0.23
25	37.22±0.13	32.14±0.16	40.06±0.28	22.98±0.22	28.02±0.35	25.66±0.13	24.64±0.24	25.48±0.010	29.00±0.13
35	48.11±0.31	42.33±0.36	48.13±0.26	29.01±0.31	36.08±0.45	40.55±0.12	28.22±0.27	32.03±0.34	38.12±0.37
45	59.44±0.42	55.99±0.31	59.13±0.34	35.08±0.22	44.06±0.14	49.00±0.18	38.12±0.38	45.89±0.32	48.89±0.15
60	68.12±0.24	65.25±0.24	68.03±0.27	45.60±0.39	54.66±0.23	59.23±0.12	42.21±0.34	57.12±0.18	55.25±0.14
75	75.12±0.21	68.82±0.31	77.19±0.23	59.11±0.12	66.28±0.32	68.89±0.26	58.02±0.12	66.03±0.14	68.02±0.28
90	79.56±0.14	74.00±0.14	81.64±0.12	71.43±0.14	78.60±0.13	70.09±0.22	69.23±0.36	71.01±0.26	71.03±0.24
105	88.99±0.28	88.55±0.15	89.00±0.36	87.95±0.28	88.73±0.16	82.08±0.13	81.02±0.24	81.33±0.23	77.01±0.16
120	92.12±0.14	95.19±0.15	90.19±0.12	96.91±0.39	98.20±0.36	88.01±0.29	96.23±0.18	90.01±0.18	88.03±0.28

SEM

SEM was performed to examine the physical appearance and shape of the Rosuvastatin calcium pastilles. The SEM images reveal that the pastilles are spherical in shape [Figure 7].[45,46]

Experimental design and data analysis

All experiments were conducted in triplicate (n = 3), and results are reported as mean ± standard deviation. Statistical analysis was performed using Design Expert® software version 13.0.0. ANOVA was employed to assess the significance of formulation variables and their interaction effects. Statistical significance was considered at $P < 0.05$.

Optimization of pastilles by design of experiment

The ANOVA test provided statistical confirmation of this influence's importance. Nine studies were conducted to improve the formulation of Pastilles to achieve maximum drug release in terms of response, in accordance with the 32 experimental designs that were utilized. The results were input into design expert software.13.[47]

Table 3: Drug release kinetic

Time (min)	Cumulative % drug released	Percentage drug remaining	Square root time	Log cumulative % drug remaining	Log time	Log cumulative % drug released	Percentage Drug released
0	0	100	0.000	2.000	0.000	0.000	100
5	8.04	91.96	2.236	1.964	0.699	0.905	8.04
10	14.56	85.44	3.162	1.932	1.000	1.163	6.52
15	20.04	79.96	3.873	1.903	1.176	1.302	5.48
25	28.02	71.98	5.000	1.857	1.398	1.447	7.98
35	36.08	63.92	5.916	1.806	1.544	1.557	8.06
45	44.06	55.94	6.708	1.748	1.653	1.644	7.98
60	54.66	45.34	7.746	1.656	1.778	1.738	10.6
75	66.28	33.72	8.660	1.528	1.875	1.821	11.62
90	78.60	21.4	9.487	1.330	1.954	1.895	12.32
105	88.73	11.27	10.247	1.052	1.000	1.948	10.13
120	98.2	1.8	10.954	0.255	2.079	1.992	9.47

Table 4: Model fitting of optimized batch of Rosuvastatin calcium pastilles

Run	Zeroorder	Firstorder	Higuchimodel	Korsmeyers peppas model	Hixon crowell
R^2	0.9828	0.9763	0.9678	0.8889	0.9800

Table 5: Summary of effect of independent variable on dependent variables

S. No.	Independent variables	Drug release	Drug content
1	Gelucire	Directly proportional (As Gelucire increases drug release increases)	Directly proportional (As Gelucire increases Drug Content increases)
2	Polyethylene glycol 6000	Directly proportional (As Gelucire increases drug release increases	Directly proportional (As Gelucire increases Drug Content increases

Table 6: Stability studies of rosuvastatin calcium pastilles

Time (day)	Color	Shape	Drug content (%)	*In vitro* drug release (%)
0	No change	No change	96.66±0.22	98.02±024
30	No change	No change	96.03±0.26	98.06±022
60	No change	No change	96.04±0.24	98.30±0.18
90	No change	No change	95.98±0.23	98.20±0.14

Effect analysis on drug release

The Predicted vs Actual plot demonstrates good agreement between the experimental and model-predicted drug release values, indicating the adequacy and reliability of the optimization model. The 3D surface plot illustrates the influence of the formulation variables on drug release. It shows that increasing the concentration of Gelucire significantly affected the drug release profile. An optimum concentration of Gelucire resulted in controlled and enhanced drug release, whereas excessive amounts tended to reduce the release rate due to increased matrix density.

Effect analysis on drug content

The Predicted vs Actual plot shows a close correlation between the predicted and observed drug content values, confirming the accuracy of the statistical model. The 3D surface plot indicates that Gelucire concentration had a positive effect on drug content up to an optimum level, resulting in uniform drug distribution within the formulation. Beyond the optimum concentration, no significant improvement in drug content was observed.[48]

Hence, from the overall study, it has indicated that PEG 6000 plays a crucial role in enhancing the thermal stability, whereas gelucire 50/13 improves solubility and, thereafter bioavailability.[49,50]

Stability studies[51]

In accordance with the requirements set forth by the ICH, the improved formulation underwent expedited stability testing. For 30, 60, and 90 days, measures like drug content and *in vitro* drug release were evaluated both before and after exposure to accelerated circumstances. With a temperature of 40 ± 2°C and a relative humidity of 75 ± 5%, the accelerated circumstances were created to mimic harsh environmental conditions that can accelerate the deterioration of pharmaceutical products. Stability studies of prepared pastilles are shown in Table 6, which also displays minor parameter changes that suggest formulations are stable.

CONCLUSION

The optimized Rosuvastatin calcium pastilles prepared using Gelucire 50/13 and PEG 6000 demonstrated improved solubility and dissolution performance compared with the pure drug and marketed formulation. FTIR analysis confirmed drug–excipient compatibility, while DSC and XRD studies indicated partial amorphization of the drug. Stability testing under accelerated conditions showed no significant changes in formulation characteristics over 3 months. These findings suggest that lipid-based pastillation is a promising approach for improving the dissolution behavior of poorly water-soluble Rosuvastatin calcium.

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AUTHORS CONTRIBUTIONS

All authors have contributed equally to this work.

SUMMARY

Pastilles enhance drug delivery by improving dissolution and bioavailability, aiming for sustained optimal drug levels and targeted delivery. Typically, hemispherical and taken orally, they combine drugs with polymers like Gelucire 50/13 and PEG 6000, often found in capsules or sachets. For Rosuvastatin calcium, used to treat hyperlipidemia, pastilles were created through hot melt processing, which transforms the drug from crystalline to amorphous, improving release. *In vitro* studies showed significant drug release, with formulations containing lower polymer concentrations performing well. Statistical analysis with Design Expert Software 7.0.0 confirmed a 98.20% drug release, 96.06% drug content, and practical yield exceeding 95%.

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