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Optimization and Characterization of Mouth Dissolving Tablets for Enhanced Solubility of Antiemetic Drugs Using Hydrotropic Techniques

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Abstract

This study centers around the detailing and improvement of mouth dissolving tablets (MDTs) for upgrading the dissolvability of antiemetic drugs, especially Piroxicam, utilizing hydrotropic strong scatterings. Hydrotropes like sodium benzoate, ascorbic corrosive, and sodium acetic acid derivation were utilized to work on the dissolvability of Piroxicam, an ineffectively water-solvent medication. Different plans were created utilizing a factorial plan to concentrate on the impact of crospovidone and camphor on basic tablet boundaries like deterioration time and friability. The streamlined bunch (F9) showed fast breaking down (12 seconds) and good mechanical properties, demonstrating its true capacity for worked on understanding consistence and helpful viability. The optimized formulation's robustness was confirmed by stability tests.

Keywords: Mouth dissolving tablets, Piroxicam, hydrotropic solubilization, solid dispersions, drug solubility, crospovidone, camphor, friability, disintegration time, bioavailability.

1. INTRODUCTION

The drug candidate's water solubility is an intrinsic quality that aids absorption; this trait is crucial to the performance of orally given dosage forms.[1] The need for the development of new dose forms in conjunction with the convenience of medicine has been highlighted by recent study. ODTs have several benefits, but they are especially helpful for elderly people who have trouble swallowing regular pills. Additionally, children do not swallow them since their muscles and neural systems are still developing. At present, MDTs are the most popular and well-received dose forms among patients.

Once the oral pills are dissolved in the mouth, they are absorbed quickly and their effects are felt more quickly. When administered as MDTs, the medications that are absorbed before the stomach contract seem to have a higher oral bioavailability.[2] The process of solid dispersion is responsible for the improved solubility and bioavailability of medications that are not very soluble in water.[3] Hydrotropic solubilisation refers to the process by which the addition of another solute increases the drug's water solubility. [4-5]

In the mouth, MDTs cause the dose form to dissolve quickly (>1 minute), and the converted residue is readily swallowable.[6] The molecular name for piroxicam is 4-hydroxy-2-methyl-N- (2-pyridyl)-2H-1,2-benzothiazine-3-carboxamide-1,1-dioxide. Rheumatoid arthritis, osteoarthritis, and other joint problems may be treated with this selective COX-2 inhibitor. It was challenging to design an adequate dose form with improved absorption properties due to the drug's low water solubility.[7] Therefore, the hydrotropic solubilisation process was used to create Piroxicam MDTs as part of the research.

2. MATERIALS AND METHODS

2.1 Selection of Hydrotrope for Poorly Aqueous Soluble Drug

Ascertaining the solubility of an equilibrium solution at ambient temperature

The various dissolving agents, which included distilled water, a 20% sodium acetate solution, sodium benzoate, and ascorbic acid, were combined with excess doses of the medication in their own containers. These were then mechanically agitated for 12 hours at 28°±1°C, allowed to equilibrate for 24 hours, and then centrifuged for 5 minutes at 2000 rpm. Whatman filter paper (No. 41) was used to pass the supernatant in every instance.

Spectrophotometric analysis was performed on each filtrate after it was appropriately diluted.[8]

2.2 Drug-Excipient Compatibility Study

Technique known as thin layer chromatography

The experiment used plates covered with silica gel (F254) as the stationary phase and mobile phases consisting of ethyl acetate, toluene, and butylamine in a ratio of 2:2:1 (v/v/v). At 254 nm, spots were analysed.[9]

2.3 Preparation of Hsds And Pms

Making Hydrotropic Solid Dispersions (HSDs)

A semisolid mass was obtained by adding 1.0 g of piroxicam to 2.0 g of sodium benzoate in a water-based solution that was kept at a constant temperature between 80 and 850 C. The mixture was then agitated. In order to hasten the drying process (60-650C), the bulk was distributed after evaporation. The crushed mixture was dried in an oven many times after being pulverised. After removing the liquid, the resulting dry powder (HSD) was sieved (#100) and kept in a sealed refrigerator for six days.

Additional PM formulations including Piroxicam and the aforementioned ingredients were also created using the same procedure. These included a 1:2 ratio of Piroxicam to sodium benzoate, a 1:2 ratio of Piroxicam to sodium acetate, and a 1:2 ratio of Piroxicam to ascorbic acid.

Physical Mixtures (PM) Preparation

After passing through mechanical sifting (#100), the sodium benzoate and piroxicam (1:2 w/w) were thoroughly mixed by triturating them for 10 minutes. Similarly, Piroxicam and sodium acetate (1:2, 1:4 & 1:6 w/w), Piroxicam and ascorbic acid (1:2, 1:4 & 1:6 w/w)), and Piroxicam and sodium benzoate (1:4 & 1:6 w/w) were also produced using the same procedures (Table 1).[10]

2.4 Evaluation of Hsds And Pms

Assessment of medicinal content in manufactured HSDs and PMs

After adding 50 ml of distilled water, a mixture of powdered HSD/PM containing 10 mg equivalent of Piroxicam was shaken until completely dissolved. Lastly, 100 ml of distilled water was added to correct the volume. At each wavelength, the absorbance was measured in comparison to the blank. To get a ballpark figure for the medication concentration, we employed the regression equation.

Research on the dissolution rates of pure drugs, PMs, and HSDs

A consistent temperature of 37° ± 0.5°C and an adjusted speed of 50 rpm were maintained for the stirrer. Identical quantities (5 ml) of the removed medium were diluted appropriately and examined at predetermined intervals. The absorbances of samples that were appropriately diluted were measured at certain wavelengths in comparison to the blank.the eleventh

For the purpose of developing MDT, the best HSD was selected.

2.5 Pre-Compression Parameters

In the aforementioned research, hydrotropic solid dispersion was investigated for a number of characteristics, including bulk density, tapped density, Hausner's ratio, Carr's index, and angle of repose.

2.6 Restartable Piroxicam Tablets for Mouth Dissolvement

To begin with, in order to filter out various superdisintegrants, six batches of tablets were devised and manufactured using the direct compression technique.

Various superdisintegrants, mannitol, saccharin, magnesium stearate, camphor, menthol, and solid dispersion (20 mg Piroxicam equivalents) were included in these tablets. The pill weight remained consistent across all batches (Table 2).

2.7 Experimental Design

We ran the experiments for every conceivable combination using a 32 complete factorial design. As shown in Tables 3, 4, and 5, the independent variables for Factor A and B, respectively, were the percentages of superdisintegrant (Crospovidone) (X) and subliming agent (Camphor) (Y) (0, 5, and 10).

2.7 Parameters for Post-Compression Evaluation

A number of post-compression characteristics were investigated, including hardness, thickness, friability, uniformity of weight, disintegration time, wetting time, water absorption ratio, optimisation, and accelerated stability, in accordance with the official descriptions.[12–15]

3. RESULTS AND DISCUSSION

3.1 Asset Solution Value Determinations

A determination was made of the solubility enhancement ratios with certain hydrotropes (Table 5).

3.2 Tlc Procedure

Figure 2 shows that the drug compatibility of Piroxicam was validated by the Rf values, which were reasonably comparable (0.74–0.76) when measured with the pure medication and when combined with other components.

Analysing Physical Mixtures and Solid Dispersions

Finding the amount of medication

Table 6 summarises the results of the drug content determinations for each formulation.

investigations on the solubility of the medication, PMs, and HSDs in vitro

Figure 3 shows the findings of a comparison of the percentage drug release achieved with a physical combination, a hydrotropic solid dispersion, and pure drug. In comparison to its equivalent, PM, the 1:6 ratio of drug to sodium benzoate (HSD) produced the most noticeable release in distilled water. It follows that PM was dropped in favour of HSD for future research.

3.3 Tablet Formulation Evaluation Parameters

Trial batch pre-compression settings

After using the (T1-T6) formulas, the following pre-compression parameters were found to be within the specified ranges: bulk density (0.657-0.682gm/cc), tapped density (0.712-0.737gm/cc), angle of repose (25.24-27.540), carry's index (6.03-8.87%), and Hausner's ratio

(1.06-1.09).

Test batches' post-compression settings

Wetting time (21-34 sec.), thickness (2.42-2.56), weight variation (passed), hardness (3.1-4.2 kg), friability (0.342-0.557%), and water absorption ratio (65.18-80.51%) were the outcomes gained from the inferred formulations (T1-T6).

Table 1: Different drug and hydrotrope ratios in PM and HSD

S. No.	Drug / hydrotrope ratio
1.	1:2 (Sodium Benzoate/ Sodium acetate/ Ascorbic acid)
2.	1:4 (Sodium Benzoate/ Sodium acetate/ Ascorbic acid)
3.	1:6 (Sodium Benzoate/ Sodium acetate/ Ascorbic acid)

This table shows the drug-to-hydrotrope ratios used in different formulations. Three hydrotropes (Sodium Benzoate, Sodium Acetate, and Ascorbic Acid) were used at three different ratios: 1:2, 1:4, and 1:6. The table compares the physical mixture (PM) and hydrotropic solid dispersion (HSD) formulations based on these ratios to optimize solubility and drug content.

Table 2: Schematic for Initial Trial Batches

Ingredients*	T1	T2	T3	T4	T5	T6
Hydrotropic Solid Dispersion	18.22	18.22	18.22	18.22	18.22	18.22
Sodium Starch Glycolate	2	-	4	-	4	-
Crospovidone	-	2	-	4	-	4
Camphor	-	-	-	-	5	5
Mannitol	54	54	54	54	54	54
Saccharin	8	8	8	8	8	8
MCC	114.78	114.78	112.78	112.78	107.78	107.78
Magnesium Stearate	2	2	2	2	2	2
Menthol	1	1	1	1	1	1
Total	200	200	200	200	200	200

* All quantities in mg

This table presents a detailed composition of six initial trial batches (T1–T6) for solid dosage forms. Each batch contains various excipients like sodium starch glycolate, crospovidone, camphor, and mannitol in different amounts. The total weight of each batch is kept constant at 200 mg. The variation in the ingredients helps identify the most effective formulation for improving the dissolution and other physical properties of the drug.

Table 3: Coded and actual values are used to design the runs

Runs	**Type**	**Coded values**		**Actual values**	
		Factor A	**Factor B**	**Factor A (%)**	**Factor B (%)**
1.	Axial	-1	0	2	5
2.	Factorial	-1	-1	2	0
3.	Factorial	-1	1	2	10
4.	Center	0	0	3.5	5
5.	Axial	0	1	3.5	10
6.	Factorial	1	-1	5	0
7.	Axial	0	-1	3.5	0
8.	Factorial	1	1	5	10
9.	Axial	1	0	5	5

This table provides the coded and actual values of two variables, Factor A and Factor B, used in designing the experiment. Factor A refers to crospovidone, and Factor B refers to camphor. The table includes different types of experimental runs such as axial, factorial, and center points, with specific percentages for Factors A and B. The experiments were conducted to study their effects on formulation parameters like disintegration time and friability.

Table 4: 32 Full Factorial Designs Provide the Basis for the Formulations

Ingredients*	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**
Hydrotropic Solid Dispersion	18.22	18.22	18.22	18.22	18.22	18.22	18.22	18.22	18.22
Crospovidone	4	7	10	4	7	10	4	7	10
Camphor	0	0	0	10	10	10	20	20	20
Mannitol	54	54	54	54	54	54	54	54	54
Saccharin	8	8	8	8	8	8	8	8	8

MCC	112.78	109.78	106.78	102.78	99.78	96.78	92.78	89.78	86.78
Magnesium Stearate	2	2	2	2	2	2	2	2	2
Menthol	1	1	1	1	1	1	1	1	1
Total	200	200	200	200	200	200	200	200	200

* All quantities in mg

This table summarizes the ingredients in nine different formulations (F1–F9) developed using a full factorial design. The hydrotropic solid dispersion amount is constant across all formulations, but other excipients like crospovidone, camphor, and MCC (microcrystalline cellulose) are varied. This allows the investigation of how these variations influence the final product characteristics such as hardness, solubility, and compressibility.

Table 5: Results from Equilibrium Solubility Tests for Improved Solubility

Hydrotrope solution	Conc. of hydrotrope	Solubility (mg/ml)	Solubility enhancement ratio
Distilled water	-	0.231	-
Ascorbic acid	20%	2.426	10.50
Sodium benzoate	20%	8.262	35.76
Sodium acetate	20%	3.112	13.47

This table displays the results of solubility tests for different hydrotrope solutions. It compares the solubility of the drug in distilled water, ascorbic acid, sodium benzoate, and sodium acetate, with each hydrotrope at a 20% concentration. Sodium benzoate showed the highest solubility enhancement ratio of 35.76, making it the most effective in increasing drug solubility.

Table 6: Solid Dispersion and Drug Content in a Physical Composition

Hydrotrope	Drug hydrotrope ratio	Percent Drug Content	
		PM	HSD
Ascorbic Acid	1:2	91.34	95.18
	1:4	92.67	95.37
	1:6	93.89	96.62
Sodium	1:2	97.34	99.78
	1:4	98.67	99.89

Benzoate	1:6	98.78	99.12
Sodium Acetate	1:2	93.45	95.92
	1:4	94.66	96.73
	1:6	95.87	97.99

This table shows the percent drug content in physical mixtures (PM) and hydrotropic solid dispersions (HSD) for different drug-to-hydrotrope ratios (1:2, 1:4, and 1:6). The table highlights that hydrotropic solid dispersions generally provide higher drug content than physical mixtures, with sodium benzoate achieving nearly 100% drug content in HSD at all tested ratios.

Table 7: Outcome of factorial batch pre-compression parameters (f1-f9)

S. No.	Formulation	ulk Density (gm/cc)	pped Density (gm/cc)	Angle of Repose (ɵ)	Carr's index	ausner's Ratio
1.	F1	0.664	0.711	26.85	6.61	1.07
2.	F2	0.687	0.727	25.32	5.50	1.05
3.	F3	0.661	0.722	26.16	8.44	1.06
4.	F4	0.656	0.698	27.01	6.01	1.09
5.	F5	0.681	0.726	26.53	6.19	1.06
6.	F6	0.659	0.717	25.67	8.08	1.06
7.	F7	0.676	0.733	27.29	7.77	1.08
8.	F8	0.683	0.729	26.99	6.31	1.06
9.	F9	0.678	0.719	26.31	5.70	1.06

This table reports the pre-pressure attributes like mass thickness, tapped thickness, point of rest, Carr's record, and Hausner's proportion for nine definitions (F1-F9). Understanding the powder mixture's flowability and compressibility, which have a direct impact on the tableting procedure and final tablet quality, requires an understanding of these parameters.

Table 8: Factorial batch (f1–f9) post-compression parameter results

S. No.	Formulation	hickness (mm)	riability (%)	ardness (kg)	Weight variation	D.T (sec)	verage wetting time (sec)	ater absorption ratio (%)
1.	F1	2.64	0.348	4.7	Passed	33	36	65.24

2.	F2	2.49	0.373	4.5	Passed	30	32	67.46
3.	F3	2.59	0.401	4.3	Passed	27	29	70.97
4.	F4	2.46	0.448	4.2	Passed	25	28	70.05
5.	F5	2.48	0.476	4.1	Passed	23	25	78.72
6.	F6	2.61	0.503	3.8	Passed	21	23	80.46
7.	F7	2.48	0.535	3.4	Passed	16	18	82.14
8.	F8	2.54	0.562	3.1	Passed	14	17	83.52
9.	F9	2.64	0.591	3.2	Passed	12	15	85.56

This table presents the results of post-compression evaluations of formulations F1–F9. Key parameters like thickness, friability, hardness, weight variation, disintegration time (D.T.), wetting time, and water absorption ratio are reported. These results help assess the mechanical strength, stability, and dissolution characteristics of the tablets. Formulation F9 exhibited the fastest disintegration time and highest water absorption ratio, indicating improved performance.

Table 9: A dependent variable multiple regression analysation

For Disintegration Time					
Polynomial equation	$Y = 23.00 – 2.33A – 8.00B + 0.50AB + 1.692E\text{-}015A^2 - 1B^2$ eq. (1)				
Correlation coefficient	0.9992				
	A	**B**	**AB**	**A^2**	**B^2**
X Coefficient	-2.33	-8.00	0.50	1.692E-015	-1
P value	0.0004	<0.0001	0.057	1	0.024
For % Friability					
Polynomial equation	Y = 0.48 + 0.027A + 0.094B +7.500E-004 +6.667E-004 -7.333E-003 eq. (2)				
Correlation coefficient	1				
	A	**B**	**AB**	**A^2**	**B^2**
X Coefficient FM	0.027	0.094	7.500E-004	6.667E-004	-7.333E-003

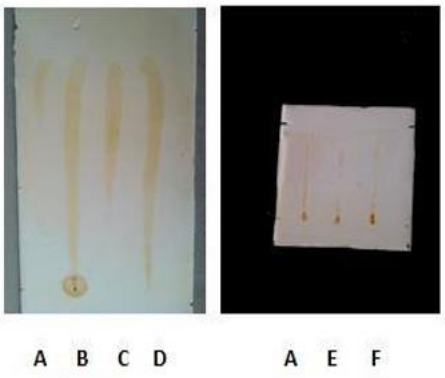
P value	<0.0001	<0.0001	0.126	0.278	0.0007

This table provides multiple regression analyses for two dependent variables: disintegration time (D.T.) and friability. Polynomial equations are derived to show the influence of factors A (crospovidone) and B (camphor) on the outcome variables. The table also lists the coefficients and p-values for each factor, highlighting the significant impact of both factors on D.T. and friability, with high correlation coefficients indicating strong model fit.

Table 10: Predicted solution for optimized batch (f9)

Factor A (Crospovidone) (mg)	Factor B (Camphor) (mg)	D.T (sec)	Friability (%)	Desirability	Remarks
10.00	20.00	12.00	0.591	1.000	Selected

This table presents the predicted optimal solution for batch F9 based on the regression analysis. Factor A (crospovidone) and Factor B (camphor) are set at 10 mg and 20 mg, respectively, to achieve the desired disintegration time of 12 seconds and a friability of 0.591%. The table also indicates a desirability score of 1.000, suggesting that this formulation is the best overall based on the criteria evaluated.



A= Piroxicam, **B**= Piroxicam : Ascorbic Acid, **C**= Piroxicam : Sodium Acetate, **D**= Piroxicam : Sodium Benzoate, **E**= Piroxicam : Sodium Starch Glycolate, **F**= Piroxicam :Crospovidone

Figure 1: Photographic representation of TLC

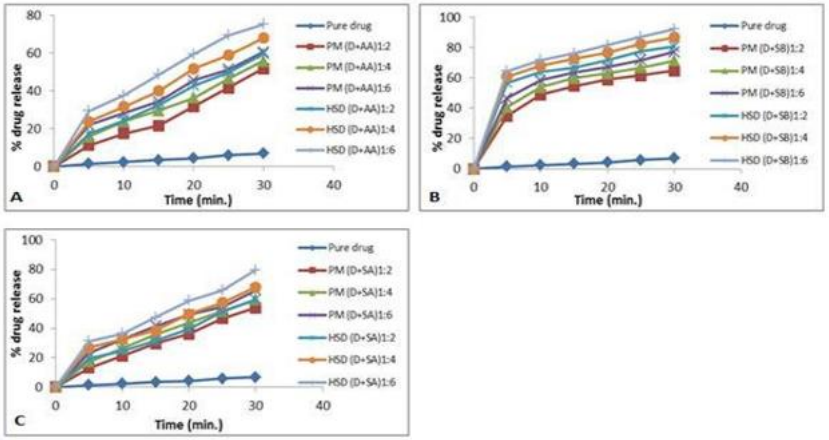


Figure 2: Comparative release profile of Physical Mixture (PM) and Hydrotropic Solid dispersion (HSD) (A) Piroxicam and ascorbic acid, (B) Piroxicam and sodium benzoate, (C) Piroxicam and sodium acetate in distilled water

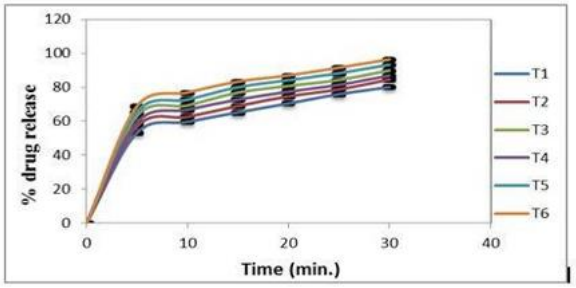


Figure 3: Comparative release profile of trial batches T1-T6 in pH 6.8 phosphate buffer (mean±S.D)

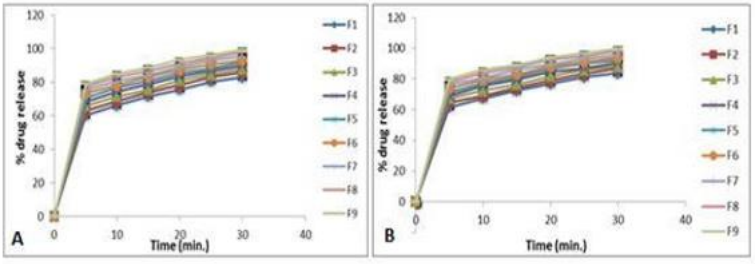


Figure 4: Comparative release profile of batches F1-F9 in (A) pH 6.8 phosphate buffer, (B) Simulated Salivary Fluid (mean±S.D)

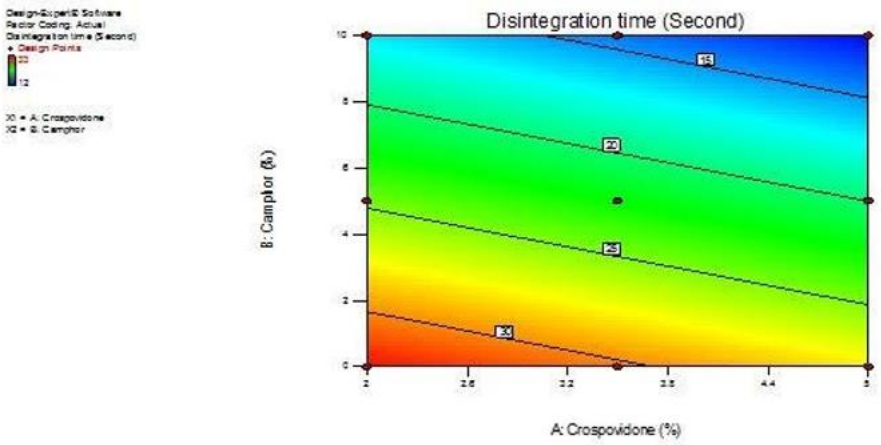


Figure 5: Contour plot showing the influence of crospovidone and camphor on D.T

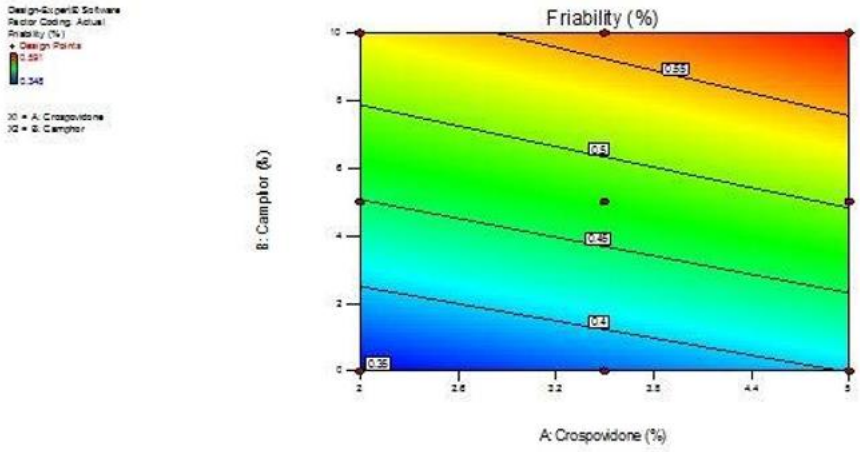


Figure 6: Desirability contour graph of optimized batch (F9) of piroxicam

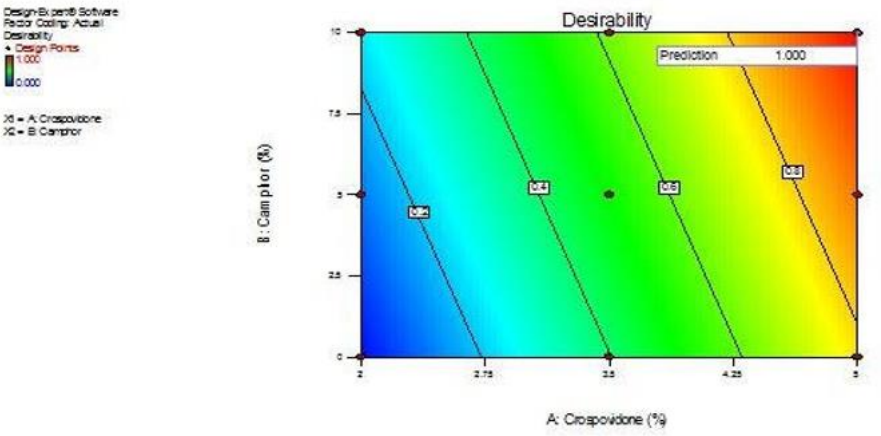


Figure 7: Contour plot showing the influence of crospovidone and camphor on friability

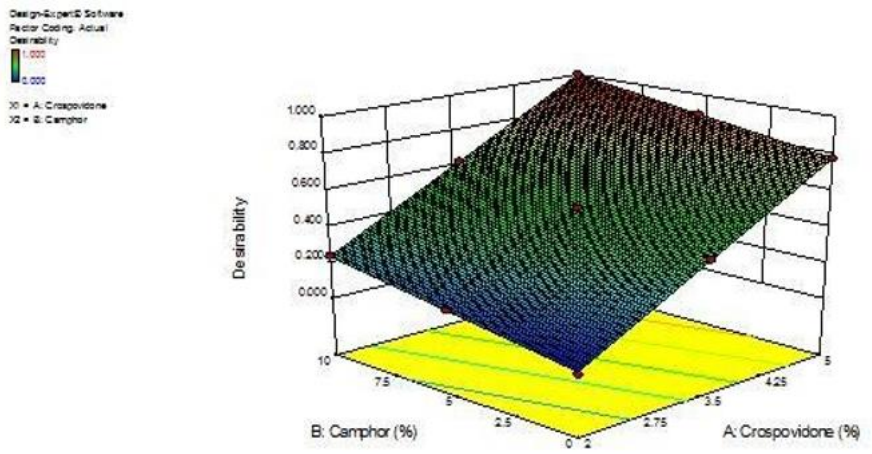


Figure 8: Desirability 3D graph of optimized batch (F9) of Piroxicam

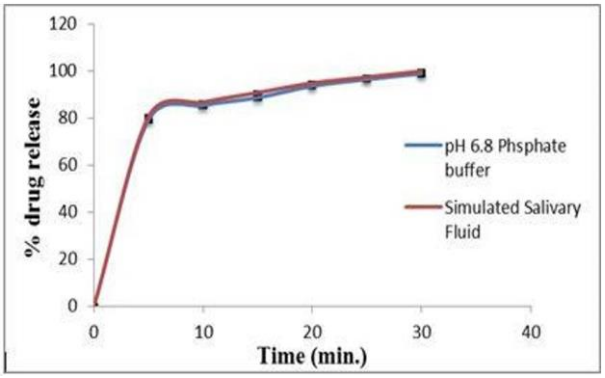


Figure 9: Comparative release profile of optimized batch (F9) in pH 6.8 phosphate buffer and Simulated Salivary Fluid (mean±S.D)

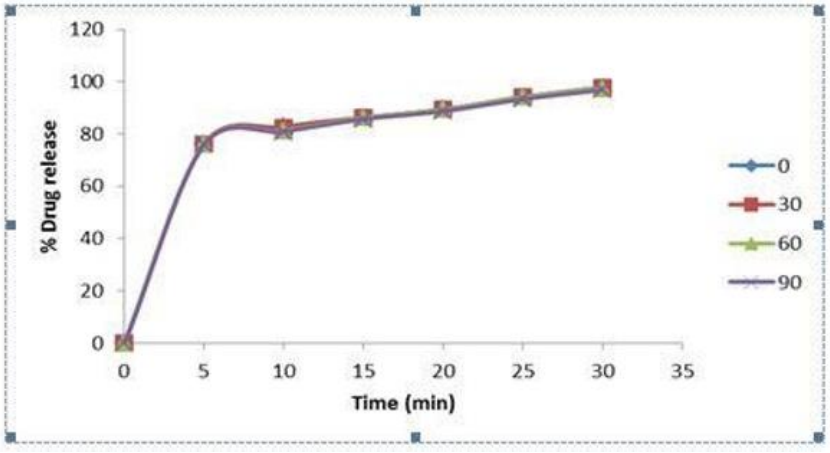


Figure 10: Comparative release profile formulation at different time intervals (0, 30, 60 and 90 days) on stability

Investigations on the in-vitro solubility of trial batches

Figure 3 displays the outcomes of an optimisation study that was carried out after the identification of T6 as the ideal batch by an in-vitro dissolving test in a pH 6.8 phosphate buffer.

Factorial batch characteristics before compression

You may see a lot of implied results in the table (Table 7) down below.

Parameters for the factorial batch after compression

Some of the results are listed in Table 8.

Using in vitro experiments to determine factorial batch solubility

The release characteristics of the produced factorial batches were evaluated using two media: a phosphate buffer with a pH of 6.8 and artificial saliva (Fig. 4).

3.4 Optimization Study

Effect of crospovidone and camphor on D.T

The impact of A and B factors on D.T. was shown to be statistically significant ($p < 0.05$, negative) in eq. (1), and the coefficients of A, B, AB, and B2 likewise had significant negative effects ($p \leq 0.05$, negative) in Table 9 and Figure 5.

Camphor and crospovidone's impact on friability

The results showed that the A and B components had a substantial positive impact on Friability ($p < 0.05$), suggesting a proportional increase in responsiveness. The positive impacts of the coefficients A, B, and B2 were found to be statistically significant at $p < 0.05$, as shown in Table 9 and Figure 6, according to equation (2). It was deduced from the results (Fig. 5,6) that the disintegration time (the colour that changes from blue to orange) reduced as camphor increased in the first response graph. Both the percentage of camphor and Crospovidone had an effect on friability, as seen in the second response surface graph.

Table 10 and Figures 7 and 8 show the projected solution data from the optimised research that was applied to the factorially designed batches (F1–F9). Formulation F9 was therefore deemed the best batch. In the pH 6.8 phosphate buffer, the optimised formulation (F9) showed a release of 98.88%, while in the simulated salivary fluid, it was 99.97% (Fig. 9).

3.5 Stability Study Of Optimized Formulation

Stability experiments conducted under officially defined circumstances (400±20C/75%±5%RH) confirmed that the optimised formulation met the dosage compliance criteria, as per ICH recommendations (Fig.10).

4. DISCUSSION

The enhancement of mouth dissolving tablets (MDTs) for ineffectively soluble drug products such as antiemetics responds to a critical stage of drug advancement. The fast rate of disintegration and the consequent holding on of MDTs make them more useful for elderly patient s who have difficulties in swallowing regular tablets as well as for children with immature muscles and brain control for swallowing. The use of strong scattering methods particularly hydrotropic solubilization has emerged as a viable approach to address improve the solubility and biopharmaceutical effectiveness of poorly water soluble drug like Piroxicam. This approach goes a long way in solving one of the biggest challenges in drug delivery through utilization of hydrotropes which are substances that enhance solubility of having poor water solubility [1,2,5].

The study establishes hydrotropic agents of Piroxicam which includes Sodium benzoate, ascorbic acid and sodium acetate that enhances solubility of Piroxicam; anti-inflammatory and analgesic drug with low water soluble characteristics. This study has suggested that there was a tremendous enhancement in terms of solubility of the drugs under study through preparation of both hydrotropic solid dispersions (HSDs) and simple physical mixtures (PMs) [12] at various DRs where sodium benzoate was found to be the most effective hydrotrope. Additionally, exploration of a central composite circulation design to optimize tablet formulations by the researchers enabled the desired assessment of the influence of crospovidone, a superdisintegrant and camphor, a subliming agent on essential properties of tablet such as the disintegration time and friability [7, 9, 10].

The optimization studies revealed that the concentrations of crospovidone and camphor required to be adjusted as per the situation desired in terms of hardness, time taken to disintegrate the tablets and the water absorption ratio. When the amount of crospovidone was 10mg and camphor was 20mg,[11] the performance of the formulation F9 was significantly good, with the disintegration time of 12 sec with good friability [11,13]. More stability tests were performed under ICH recommended conditions the stabilities prove that the formulation

in optimized batch was having similar efficacy at later time also [14-31].

It is noteworthy that this study had demonstrated the applicability of hydrotropic techniques for enhancement of MDT and other patient-centred drug formulations. By providing a solubility solution, the research is beneficial to the enhancement of pharmaceutical worth to the universal advancement in the pharmaceutical industry The research offers an approach that boosts the therapeutic impact and patient adherence level for antiemetic drugs.

5. CONCLUSION

The study effectively achieved and described hydrotropic methods in enhancing and defining mouth dissolving tablets (MDTs) of poorly water-soluble antiemetic drugs particularly, Piroxicam. Thus, the solubility of Piroxicam was increased by the addition of hydrotropes comprising of sodium benzoate, ascorbic acid and sodium acetate. Out of all the formulations, formulation nine (F9) displayed the fast disintegration, enhanced friability, and a highly efficient drug release rate for the maximum bioavailability. Therefore, this research has proved how the strategy of hydrotropic solubilization can be effective in enhancing patient compliance and effectiveness of poorly soluble drugs, especially among patients struggling with issues normally associated with conventional oral dosage forms.

REFERENCES

[1]. Khadka P, Ro J, Hyeongmin K, Iksoo K, Jeong TK. Pharmaceutical Particle Technologies: An Approach to improve drug solubility, dissolution and bioavailability. Asian Journal of Pharmaceutical Sciences 2014;9;304-316.

[2]. Patil MR, Gujarathi NA, Rane BR. Formulation and Evaluation of mouth dissolving tablet: Review Article. Pharma Science Monitor 2014;5(2);7-20.

[3]. Luhadiya A, Agrawal S, Jain P, Dubey PK. A Review on Solid dispersion. International Journal of Advance Research in Pharmaceutical and Biosciences 2012;2(2);281-291.

[4]. Kumar VS, Raja C, Jayakumar C. A Review on solubility enhancement using hydrotropic phenomena. International Journal of Pharmacy and Pharmaceutical Sciences 2014;6(6); 1- 7.

[5]. Kapadiya N, Singhvi I, Mehta K. Hydrotropy: A Promising tool for Solubility Enhancement: A Review. International Journal of Drug Development & Research 2011; 3(2); 26-33.

[6]. Ashish P, Harsoliya MS, Pathan JK, Shruti S. A Review: Formulation of Mouth dissolving tablets. International Journal of Pharmaceutical and Clinical Science 2011;1(1); 1-8.

[7]. Singh S, Shyale SS, Bhosale G. Formulation and Evaluation of Mouth dissolving tablets of Piroxicam. International Journal of Pharmaceutical Sciences and Nanotech 2015;8(3);2941-2946.

[8]. Maheshwari RK. Analysis of bulk sample of salicylic acid by application of hydrotropic solubilization method. Indian Journal of Pharmaceutical Sciences 2008; 823-825.

[9]. Starek M, Krzek, Rotkegel P. TLC determination of Piroxicam, Tenoxicam, Celecoxib and Rofecoxib in biological material. Journal of Analytical Chemistry 2015; 70(3); 351-359.

[10]. Madan JR., Kamate VJ, Awasthi R., Dua K. Recent Patents on Drug Delivery and Formulations. 2017, doi: 10.2174/1872211311666170427100213.

[11]. Maheshwari RK. Quantitative spectrophotometric determination of ornidazole tablet formulation using ibuprofen sodium as hydrotropic solubilizing agent. Digest Journal of Nanomaterial and Biostructure 2010;5(1); 97-100.

[12]. Kumar R, Patil S, Patil MB, et al. Formulation Evaluation of Mouth dissolving tablets of Fenofibrate using sublimation technique. International Journal of Chemical Technology and Research 2009;1(4);840-850.

[13]. Garg A, Gupta MM. Taste masking and formulation development & evaluation of mouth dissolving tablets of Levocetrizine dihydrochloride. Journal of Drug Delivery & Therapeutics. 2013;3(3); 123-130.

[14]. Khemariya P, Gajbhiye KR, Vaidya VD, et al. Preparation and evaluation of mouth dissolving tablets of Meloxicam. International Journal of Drug Delivery

2010;2;76-80.

[15]. Rane DR, Gulve HN, Patil VV, et al. Formulation and evaluation of fast dissolving tablet of Albendazole. International Current Pharmaceutical Journal 2012;1(10); 311-316.

[16]. Bonlawar, J., Setia, A., Challa, R.R., Vallamkonda, B., Mehata, A.K., Vaishali, , Viswanadh, M.K., Muthu, M.S. (2024). Targeted Nanotheransotics: Integration of Preclinical MRI and CT in the Molecular Imaging and Therapy of Advanced Diseases. Nanotheranostics, 8(3), 401-426. https://doi.org/10.7150/ntno.95791.

[17]. Pasala, P. K., Rudrapal, M., Challa, R. R., Ahmad, S. F., Vallamkonda, B., & R., R. B. (2024). Anti-Parkinson potential of hesperetin nanoparticles: in vivo and in silico investigations. Natural Product Research, 1–10. https://doi.org/10.1080/14786419.2024.2344740

[18]. Chakravarthy, P.S.A., Popli, P., Challa, R.R. et al. Bile salts: unlocking the potential as bio-surfactant for enhanced drug absorption. J Nanopart Res 26, 76 (2024). https://doi.org/10.1007/s11051-024-05985-6

[19]. Setia, A., Vallamkonda, B., Challa, R.R., Mehata, A.K., Badgujar, P., Muthu, M.S. (2024). Herbal Theranostics: Controlled, Targeted Delivery and Imaging of Herbal Molecules. Nanotheranostics, 8(3), 344-379. https://doi.org/10.7150/ntno.94987.

[20]. Dhamija P, Mehata AK, Tamang R, Bonlawar J, Vaishali, Malik AK, Setia A, Kumar S, Challa RR, Koch B, Muthu MS. Redox-Sensitive Poly(lactic-co-glycolic acid) Nanoparticles of Palbociclib: Development, Ultrasound/Photoacoustic Imaging, and Smart Breast Cancer Therapy. Mol Pharm. 2024 May 5. doi: 10.1021/acs.molpharmaceut.3c01086. Epub ahead of print. PMID: 38706253.

[21]. Eranti, Bhargav and Mohammed, Nawaz and Singh, Udit Narayan and Peraman, Ramalingam and Challa, Ranadheer Reddy and Vallamkonda, Bhaskar and Ahmad, Sheikh F. and DSNBK, Prasanth and Pasala, Praveen Kumar and Rudrapal, Mithun, A Central Composite Design-Based Targeted Quercetin Nanoliposomal

Formulation: Optimization and Cytotoxic Studies on MCF-7 Breast Cancer Cell Lines. Available at SSRN: https://ssrn.com/abstract=4840349 or http://dx.doi.org/10.2139/ssrn.4840349

[22]. Setia A, Challa RR, Vallamkonda B, Satti P, Mehata AK, Priya V, Kumar S, Muthu MS. Nanomedicine And Nanotheranostics: Special Focus on Imaging of Anticancer Drugs Induced Cardiac Toxicity. Nanotheranostics 2024; 8(4):473-496. doi:10.7150/ntno.96846. https://www.ntno.org/v08p0473.htm

[23]. Pasala, P. K., Rcaghupati, N. K., Yaraguppi, D. A., Challa, R. R., Vallamkond, B., Ahmad, S. F., ... & DSNBK, P. (2024). Potential preventative impact of aloe-emodin nanoparticles on cerebral stroke-associated myocardial injury by targeting myeloperoxidase: In Supporting with In silico and In vivo studies. Heliyon.

[24]. Randhave, N., Setia, A., Challa, R. R., Vallamkonda, B., Badgujar, P., Verma, N., ... & Muthu, M. S. (2024). Autophagy Targeted Nanomedicines and Nanotheranostics In Cancer Imaging and Therapy. Journal of Drug Delivery Science and Technology, 105945.

[25]. Kant, S., Kaur, H., Mishra, A.K. et al. Harmonizing Nature and Technology: Lipidic Nano-phytotherapeutics in the Management of Atopic Dermatitis. Rev. Bras. Farmacogn. (2024). https://doi.org/10.1007/s43450-024-00570-3

[26]. Vallamkonda, B., Satti, P., Das, D.K. et al. Enantiomeric resolution of three profen drugs using direct thin-layer chromatographic method. JPC-J Planar Chromat (2024). https://doi.org/10.1007/s00764-024-00305-z

[27]. Suseela, M. N. L., Mehata, A. K., Vallamkonda, B., Gokul, P., Pradhan, A., Pandey, J., ... & Muthu, M. S. (2024). Comparative Evaluation of Liquid-Liquid Extraction and Nanosorbent Extraction for HPLC-PDA Analysis of Cabazitaxel from Rat Plasma. Journal of Pharmaceutical and Biomedical Analysis, 116149. https://doi.org/10.1016/j.jpba.2024.116149

[28]. Gokul, Patharaj and Sobanaa, Murugesan and S, Hari Krishna Kumar and R, Prathiviraj and Pamanji, Rajesh and Lakshmi Suseela, Medapati Nikitha and Vallamkonda, Bhaskar and Setia, Aseem and Selvin, Joseph and Muthu, Madaswamy

S., Decoding Antibiotic Contaminants and Their Impact in Gingee River, Puducherry: Insights from Spe-Uplc-Ms/Ms and Zebrafish Study. Available at SSRN: https://ssrn.com/abstract=4885708 or http://dx.doi.org/10.2139/ssrn.4885708

[29]. Bhosale, A. P., Pandey, B. S., Singh, S. P., Ojha, M., Kalwala Saritharani, Vallamkonda, B., Lokhande, V., Singh, P., Jain, A. V., & Suraj Mandal. (2024). Improved detection and quantitation of nitrosamine impurities in ophthalmic solutions using LC-MS/MS. African Journal of Biochemistry Sciences, 1212–1225. https://doi.org/10.48047/AFJBS.6.Si4.2024.1212-1225

[30]. Mishra, S. K., Bhardwaj, K., Mandal, S., Singh, P., Bhaskar Vallamkonda, Yadav, R. K., Jain, A. V., & Dr. Udaybhan Yadav. (2024). Challenges in validating an LC-MS/MS method for MNP quantification in Rifampicin-Containing formulations. African Journal of Biochemistry Research, 1199–1211. https://doi.org/10.48047/AFJBS.6.Si4.2024.1199-1211

[31]. Savita Sambhaji Patil (Pol). (2024). Development and validation of a High-Throughput Method for NDMA Quantitation in Drug products using Headspace–SIFT-MS. In African Journal of Bio-Sciences (Vol. 6, Issue 2, pp. 1542–1555). African Journal of Bio-Sciences. https://doi.org/10.48047/AFJBS.6.2.2024.1542-1555