IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

Formulation and Evaluation of Floating Tablet

Miss. Ashvini Kundlik Jadhao, Prof. Unmesh M. Joshi[2], Dr. H. A. Sawarkar, Dr. K. R. Biyani
Anuradha College of Pharmacy, Chikhali, Buldana, Maharashtra, India

Abstract: *The formulation and evaluation of floating tablets of Piroxicam aimed to develop a gastro-retentive drug delivery system enhancing the bioavailability and therapeutic efficacy of the drug. The standard graph of Piroxicam was constructed by plotting absorbance against concentration, revealing a linear relationship within the concentration range of 16 µg/ml to 24 µg/ml, demonstrating the method's accuracy for quantification purposes. FTIR studies were conducted to analyze the molecular structure and drug-excipient compatibility, showing characteristic peaks and interactions that confirmed formulation integrity. Preformulation studies assessed the flow behavior and compressibility of the powdered blend, indicating variations in bulk density, tapped density, compressibility index, Hausner's ratio, and angle of repose among formulations (F1 to F9). Post-compression parameters such as average tablet weight, hardness, friability, and drug content were evaluated, showing consistent tablet mass and high drug content uniformity. Buoyancy studies measured buoyancy lag time and total floating time, essential for optimizing gastric retention. Swelling index studies demonstrated the formulations' potential for prolonged gastric residence. Drug release studies indicated substantial and controlled drug release over 10 hours, suggesting the efficacy of the floating tablets for sustained therapeutic effect. Overall, the evaluation confirmed that the floating tablets of Piroxicam could enhance drug bioavailability and provide extended drug release, contributing to improved patient compliance and therapeutic outcomes.*

Keywords: Piroxicam, floating tablets, standard graph, UV spectroscopy, FTIR, preformulation, buoyancy, drug release.

I. INTRODUCTION

Floating tablet technology represents a significant advancement in oral drug delivery systems, designed to enhance drug bioavailability and therapeutic efficacy.[1,2] These systems are engineered to remain buoyant on the gastric fluid for an extended period, thereby prolonging gastric residence time and facilitating a controlled release of the active pharmaceutical ingredient (API). This innovation addresses the limitations associated with conventional oral dosage forms, such as variable bioavailability and short gastric residence time, particularly for drugs that are primarily absorbed in the stomach or upper part of the small intestine.[3]

The development of floating tablets involves a multifaceted approach encompassing diverse formulation strategies and techniques. The core principle behind floating tablets is their ability to maintain buoyancy in the stomach for a prolonged duration, which can be achieved through various mechanisms, including effervescent and non-effervescent systems.[4] Effervescent systems utilize gas-generating agents like sodium bicarbonate and citric acid, which react in the presence of gastric fluid to produce carbon dioxide, entrapping the gas within the polymer matrix to ensure the tablet remains afloat. Non-effervescent systems, on the other hand, rely on the swelling properties of polymers such as hydroxypropyl methylcellulose (HPMC), which expands upon contact with gastric fluid, decreasing the tablet's density to less than that of the gastric fluid.[5]

Piroxicam, a nonsteroidal anti-inflammatory drug (NSAID) used to relieve pain and inflammation, serves as an ideal candidate for floating tablet formulation due to its limited solubility in the lower gastrointestinal tract and the need for prolonged gastric retention to enhance absorption. The formulation and evaluation of Piroxicam floating tablets aim to develop a gastro-retentive drug delivery system that improves the drug's bioavailability and therapeutic outcomes.[6]

This study focuses on the comprehensive formulation development of Piroxicam floating tablets, encompassing the design, preparation, and evaluation of pre-compression and post-compression parameters. Pre-compression studies assess the flow properties and compressibility of the powdered blend, which are critical for ensuring uniformity and

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

consistency in tablet production. Post-compression evaluations examine the physicochemical characteristics of the tablets, including hardness, friability, drug content, buoyancy, swelling index, and drug release profile.[7]

The significance of this research lies in its potential to enhance patient compliance and therapeutic efficacy by providing a controlled release of Piroxicam over an extended period. Additionally, the study explores the compatibility of various excipients with Piroxicam, ensuring formulation stability and integrity. The findings contribute to the broader field of pharmaceutical sciences by advancing the knowledge and application of floating tablet technology in drug delivery systems, ultimately aiming to improve patient care and treatment outcomes.[8]

II. MATERIALS AND METHOD

Materials Used for Piroxicam Formulation

The formulation of Piroxicam, an active pharmaceutical ingredient (API), involves a variety of materials, each serving a specific purpose to ensure the efficacy, stability, and manufacturability of the drug product. Carbapol, HPMC K100 M, and Xanthan gum are utilized as polymer excipients to control the drug release and enhance the formulation's stability. Sodium bicarbonate and citric acid act as floating enhancers, providing buoyancy to the formulation in the stomach, which is beneficial for drugs intended for gastro-retentive delivery systems. PVP K30 is used as a binder to ensure that the tablets maintain their shape and integrity. Magnesium stearate and talc are included as a lubricant and glidant, respectively, to facilitate the manufacturing process by reducing friction and improving the flow of the powder blend. Potassium bromide is employed in FTIR analysis as a reagent to identify and characterize the chemical structure of Piroxicam. Methanol and 0.1N HCl are used as solvents in various analytical procedures, including dissolution testing, which is conducted in 0.1N HCl to simulate gastric conditions and determine the drug release profile.[9]

Standard Stock solution:

20 mg of Piroxicam was dissolved in 100 ml of 0.1N HCL (1000 µg/ml) .Calibration curve of Piroxicam in 0.1N HCL From the above stock solution, 1 ml was transferred into a 10 ml volumetric flask and volume was adjusted to 10 ml that corresponded to 100 µg/ml Piroxicam in solution. [10]

From that solution different aliquots of 1.6, 1.8, 2, 2.2 and 2.4 ml were transferred to 10ml volumetric flask, volume was adjusted with 0.1N HCL, which gave a concentration of 16,18,20,22 and 24 µg/ml of final standard. Standard curve was plotted by taking absorbance of secondary stock solutions in UV double beam spectrophotometer at 216 nm.[11,12]

Drug-Excipient Compatiblity study (FTIR):

The IR absorption spectra of the pure drug and with different excipients were taken in the range of 4000-400 cm-1 using KBr disc method, 1-2 mg of the substance to be examined was triturated with 300-400 mg, specified quantity, of finely powered and dried potassium bromide .These quantities are usually sufficient to give a disc of 10-15mm diameter and pellet of suitable intensity by a hydraulic press[13]

III. EXPERMENTAL METHODS

FORMULATION AND PREPARATION OF PIROXICAM FLOATING TABLETS:

The formulations underwent preparation via the direct compression method, employing various polymers. The procedure commenced with the individual sieving of Piroxicam and other components through a sieve of size 60. Subsequently, all ingredients were meticulously combined through trituration for a duration of up to 15 minutes, ensuring homogeneity of the powder mixture. To facilitate compression, Magnesium stearate was employed as a lubricant. Tablet production ensued through direct compression, adhering to the specifications outlined in the formulation table. This methodical approach aimed to ensure uniformity and efficacy in the formulation of the tablets[14]

Table 6.3: Composition of different formulations

Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9
Piroxicam	20	20	20	20	20	20	20	20	20
Carbapol	150	—	—	75	75	—	75	25	50
HPMC k100 M	—	150	—	—	75	75	50	50	75

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

Xanthan gum	—	—	150	75	-	75	25	75	25
Sodium Bicarbonate	70	70	70	70	70	70	70	70	70
Citric acid	50	50	50	50	50	50	50	50	50
PVP K30	60	60	60	60	60	60	60	60	60
Magnesium stearate	200	200	200	200	200	200	200	200	200
Talc	200	200	200	200	200	200	200	200	200
Total weight	750mg	750mg	750mg	750mg	750mg	750mg	750mg	750mg	750mg

EVALUATION OF PRE COMPRESSION PARAMETERS

Bulk density

Bulk density of a compound varies substantially with the method of crystallization, milling or formulation. Bulk density is determined by pouring pre sieved granules into a graduated cylinder via a large funnel and measure the volume and weight.

Tapped density:

Tapped density is determined by placing a graduated cylinder containing a known mass of granules and mechanical tapper apparatus, which is operated for a fixed number of taps until the powder bed volume has reached a minimum volume. using the weight of the drug in the cylinder and this minimum volume, the taped density may be computed.

Carr's Index (CI)

Carr's index is measured using the values of bulk density and tapped density.

Hausner's Ratio: It indicates the flow properties of the powder and ratio of Tapped density to the Bulk density of the powder or granules.

Angle of repose:

The manner in which stresses are transmitted through a bead and the beads response to applied stress are reflected in the various angles of friction and response.

EVALUATION OF TABLETS:

The formulated tablets were evaluated for the following physicochemical characteristics:

Hardness:

Hardness of the tablet was determined by using the Monsanto hardness tester. The lower plunger was placed in contact with the tablet and a zero reading was taken. The plunger was then forced against a spring by turning a threaded bolt until the tablet fractured.

Weight Variation

20 tablets were selected and weighed collectively and individually. From the collective weight, average weight was calculated. Each tablet weight was then compared with average weight to ascertain whether it was within the permissible limits or not. Not more than two of the individual weights deviated from the average weight by more than 7.5% for 300 mg tablets and none by more than double that percentage.

Friability test:

20 previously weighed tablets were placed in the friability apparatus, which was given 100 revolutions and the tablets were reweighed. The percentage friability was calculated by using the following formula,

Percentage friability = initial weight-final weight /initial weight × 100.

Drug content:

20 tablets of each formulation were weighed and powdered. The quantity of powder equivalent to 100 mg of Nifedipine was transferred in to a 100 ml volumetric flask and the volume adjusted to 100ml with 0.1N HCl. Further 1ml of the above solution was diluted to 100 ml with 0.1N HCl and check the absorbance of the resulting solution was observed at 216nm.

In-vitro Buoyancy studies:

The in-vitro buoyancy was determined by floating lag time, and total floating time. The tablets were placed in a 100ml beaker containing 0.1N HCl. The time required for the tablet to rise to the surface and float was determined as floating

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

lag time (FLT) and the duration of the time the tablet constantly floats on the dissolution medium was noted as the Total Floating Time respectively (TFT).

Swelling Index Studies:

The swelling behaviour of a dosage unit was measured by studying its weight gain. The swelling index of tablets was determined by placing the tablets in the basket of dissolution apparatus using dissolution medium as 0.1N HCl at 37±0.5°C. After 1, 4 and 6h each dissolution basket containing tablet was withdrawn, blotted with tissue paper to remove the excess water and weighed on the analytical balance(Schimdzu, AX 120). The experiment was performed in triplicate for each time point. Swelling index was calculated by using the following formula.

Dissolution Study:

900ml 0f 0.1 HCl was placed in the vessel and the USP apparatus –II (Paddle Method) was assembled. The medium was allowed to equilibrate to temp of 37 + 0.5°C. Tablet was placed in the vessel and the vessel was covered, the apparatus was operated for 10 hours at 50 rpm. At definite time intervals, 5 ml of the fluid was withdrawn; filtered and again 5ml of the fresh buffer was replaced. Suitable dilutions were done with the dissolution fluid and the samples were analyzed spectrophotometrically at 216 nm.[16,16]

IV. RESULTS

STANDARD GRAPH OF PIROXICAM

The standard graph of Piroxicam was constructed by plotting absorbance against concentration, using concentrations ranging from 16 µg/ml to 24 µg/ml. The resulting graph exhibited a linear relationship between concentration and absorbance, with absorbance values of 0.321, 0.372, 0.420, 0.362, and 0.512 corresponding to concentrations of 16 µg/ml, 18 µg/ml, 20 µg/ml, 22 µg/ml, and 24 µg/ml, respectively. This linear correlation demonstrates the method's sensitivity and accuracy in quantifying Piroxicam concentrations within this range. It provides a robust standard curve against which the concentration of Piroxicam in subsequent analyses can be accurately determined.

Table 1: STANDARD GRAPH OF PIROXICAM

Conc (ug/ml)	Absorbance
16	0.321
18	0.372
20	0.420
22	0.362
24	0.512

The creation of the standard graph is a critical step in pharmaceutical analysis, as it serves as a reference point for quantification purposes. By establishing a linear relationship between concentration and absorbance, the standard graph enables researchers to interpolate unknown concentrations of Piroxicam based on their corresponding absorbance values. This methodology ensures the reliability and reproducibility of Piroxicam quantification, essential for assessing drug content uniformity, dissolution profiles, and formulation consistency.

Moreover, the standard graph of Piroxicam in 0.1N HCl provides insights into the compound's solubility and dissolution characteristics under simulated physiological conditions. By analyzing the absorbance values at different concentrations, researchers can infer the compound's behavior in solution and its potential interactions with excipients or other components of pharmaceutical formulations.

In last, the standard graph of Piroxicam in 0.1N HCl represents a fundamental tool for pharmaceutical analysis, enabling accurate quantification of Piroxicam concentrations in formulations and dissolution media. Its construction and interpretation facilitate quality control, formulation development, and regulatory compliance in the pharmaceutical industry, ultimately contributing to the production of safe, effective, and consistent drug products.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

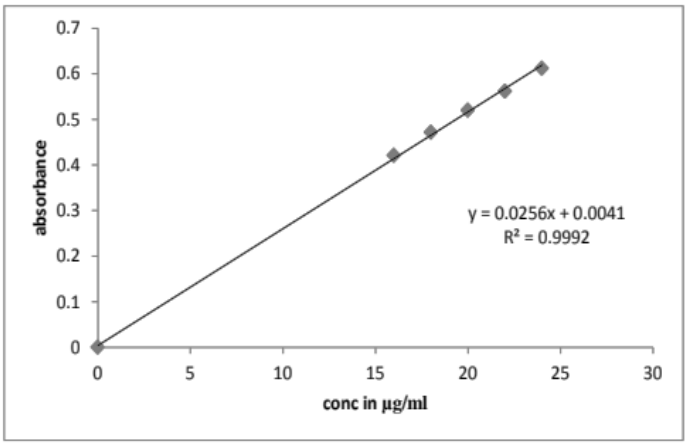

Fig 1: standard graph of piroxicam

FT-IR STUDIES:

FTIR (Fourier-transform infrared) spectroscopy was employed to analyze the molecular structure and composition of Piroxicam and its final formulation. The FTIR spectra provide valuable information about the functional groups present in the samples, aiding in the assessment of drug-excipient compatibility and formulation integrity

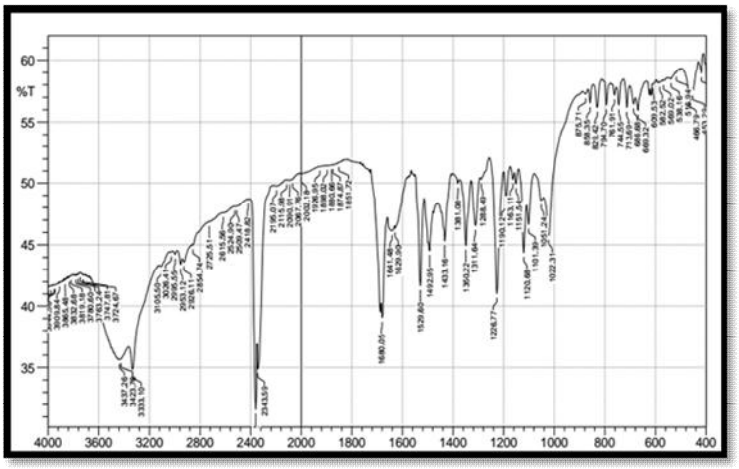

Fig 2: FTIR Spectra of Piroxicam

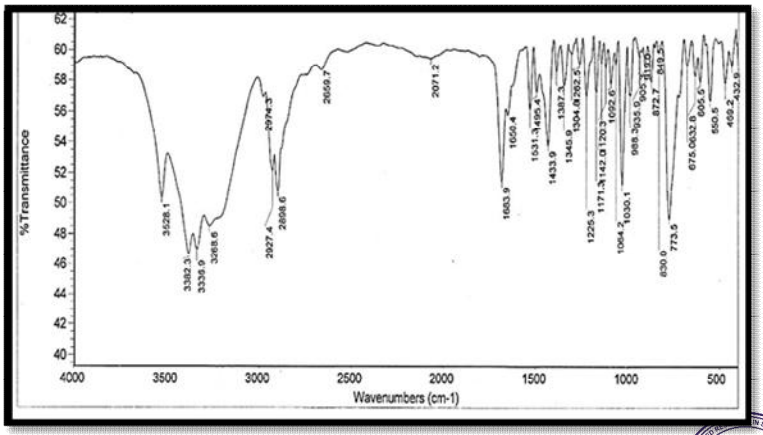

Fig 3: FTIR Spectra of Piroxicam final formulation

DOI: 10.48175/568

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

In the FTIR spectra of Piroxicam, characteristic peaks corresponding to specific vibrational frequencies of functional groups within the molecule were identified. These peaks serve as fingerprints for the compound, enabling its identification and characterization. Common functional groups observed in the spectra include aromatic rings, carbonyl groups, and various bonds such as C-H and C=O bonds.

Upon comparison with the FTIR spectra of the final formulation of Piroxicam, any shifts, changes in intensity, or appearance/disappearance of peaks were noted. These spectral changes can indicate interactions between Piroxicam and excipients, alterations in molecular structure due to formulation processes, or the presence of new functional groups arising from excipient-drug interactions.

Peak shifts, if observed, may suggest hydrogen bonding or changes in molecular conformation induced by the formulation process. New peaks or the absence of peaks in the final formulation spectrum compared to pure Piroxicam may indicate the incorporation of excipients or alterations in the chemical environment. Changes in peak intensities can also provide insights into concentration differences or interactions between molecules in the final formulation compared to pure Piroxicam.

Overall, FTIR studies offer a comprehensive analysis of Piroxicam and its final formulation, elucidating molecular changes, interactions with excipients, and formulation quality. By providing valuable insights into the compatibility and integrity of the formulation, FTIR spectroscopy contributes to the development of safe, effective, and stable pharmaceutical products.

PREFORMULATION STUDIES OF POWDERED BLEND

Preformulation studies play a crucial role in assessing the physicochemical properties of a powdered blend, providing valuable insights into its flow behavior and compressibility. The table presents the results of preformulation studies conducted on different formulations (F1 to F7), evaluating parameters such as bulk density, tapped density, compressibility index, Hausner's ratio, and angle of repose.

Table 2: PREFORMULATION STUDIES OF POWDERED BLEND

Formulation Code	Bulk Density (g/mL)	Tapped Density (g/mL)	Compressibility Index (%)	Hausner's Ratio	Angle of Repose (θ)
F1	0.67 ± 0.035	0.57 ± 0.01	16.236 ± 0.6	1.146 ± 0.06	23.62 ± 0.21
F2	0.34 ± 0.023	0.53 ± 0.04	14.224 ± 0.7	1.211 ± 0.04	28.64 ± 0.11
F3	0.41 ± 0.015	0.48 ± 0.5	17.313 ± 0.8	1.48 ± 0.08	29.34 ± 0.31
F4	0.52 ± 0.046	0.55 ± 0.09	16.10 ± 0.2	1.45 ± 0.02	31.46 ± 0.31
F5	0.75 ± 0.014	0.60 ± 0.07	11.23 ± 0.6	1.51 ± 0.04	25.28 ± 0.15
F6	0.56 ± 0.047	0.50 ± 0.09	13.18 ± 0.8	1.33 ± 0.08	27.24 ± 0.61
F7	0.54 ± 0.034	0.57 ± 0.01	15.313 ± 0.8	1.38 ± 0.08	32.46 ± 0.25
F8	0.74 ± 0.014	0.52 ± 0.09	17.10 ± 0.2	1.41 ± 0.04	24.28 ± 0.15
F9	0.38 ± 0.023	0.47 ± 0.5	12.23 ± 0.6	1.35 ± 0.02	28.34 ± 0.31

Bulk density, representing the mass per unit volume of the powder when freely poured into a measuring vessel, ranged from 0.34 g/mL to 0.75 g/mL across the formulations. Tapped density, indicating the maximum density achieved upon tapping or vibration, varied from 0.48 g/mL to 0.60 g/mL.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

Compressibility index, calculated as the percentage difference between tapped density and bulk density, ranged from 11.23% to 17.313%. Hausner's ratio, the ratio of tapped density to bulk density, ranged from 1.146 to 1.51, reflecting the powder's flow properties. A higher Hausner's ratio suggests poorer flowability.

The angle of repose, an indicator of flowability, ranged from 23.62° to 32.46°. Higher angles of repose indicate poorer flow properties. Overall, the results indicate variations in flow behavior and compressibility among the different formulations, which could impact subsequent processing steps such as tablet compression.

These preformulation studies provide valuable data for formulation development, guiding the selection of excipients and optimization of processing parameters to achieve desired flow properties and compressibility in the final dosage form. Additionally, they contribute to ensuring product consistency and manufacturability, ultimately enhancing the quality and performance of the formulated product

POST COMPRESSION PARAMETERS

The post-compression parameters provide crucial insights into the quality and characteristics of the formulated tablets. The table presents the average weight of tablets, hardness, friability, and drug content for different formulations (F1 to F9).

The average weight of tablets ranged from 334 mg to 367 mg across formulations, indicating consistency in tablet mass. Hardness, a measure of tablet strength, varied from 5.3 kg/cm² to 7.2 kg/cm², suggesting differences in tablet compactibility and resistance to mechanical stress.

Friability, which assesses the tendency of tablets to withstand abrasion, ranged from 0.327% to 0.695%. Lower values indicate better tablet integrity and durability during handling and transportation.

Table 3: POST COMPRESSION PARAMETERS

Formulation No.	Average Weight of Tablet (mg)	Hardness (kg/cm²)	Friability (%)	% Drug Content (mg)
F1	343 ± 0.6	7.2 ± 0.4	0.636 ± 0.5	98.11 ± 0.7
F2	340 ± 0.9	6.5 ± 0.4	0.532 ± 0.2	98.23 ± 0.5
F3	347 ± 0.3	6.4 ± 0.6	0.627 ± 0.1	98.43 ± 0.6
F4	341 ± 0.4	6.6 ± 0.1	0.541 ± 0.4	99.44 ± 0.6
F5	336 ± 0.8	5.6 ± 0.6	0.695 ± 0.8	98.22 ± 0.6
F6	334 ± 0.8	5.3 ± 0.4	0.585 ± 0.2	98.52 ± 0.5
F7	367 ± 0.3	5.4 ± 0.6	0.327 ± 0.3	98.53 ± 0.6
F8	342 ± 0.9	6.3 ± 0.1	0.495 ± 0.8	98.47 ± 0.6
F9	339 ± 0.8	6.2± 0.1	0.531 ± 0.4	98.32 ± 0.6

The percentage drug content ranged from 98.11% to 99.44%, indicating uniformity in drug distribution within the tablets. This parameter is critical for ensuring accurate dosage delivery and therapeutic efficacy.

Overall, the post-compression parameters reflect the quality attributes of the formulated tablets, providing essential data for evaluating their performance, stability, and suitability for pharmaceutical use. These parameters are instrumental in maintaining product consistency and meeting regulatory standards for pharmaceutical manufacturing.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

Buoyancy Lag Time (min) and Total Floating Time (hrs)

The table outlines the buoyancy characteristics of different formulations (F1 to F9), including buoyancy lag time and total floating time.

Table 4: Buoyancy Lag Time (min) and Total Floating Time (hrs)

Formulation No.	Buoyancy Lag Time (min)	Total Floating Time (hrs)
F1	24	4
F2	17	7
F3	22	11
F4	31	16
F5	58	8
F6	37	9
F7	24	12
F8	23	8
F9	39	11

Buoyancy lag time refers to the duration taken by the tablet to rise to the surface and float after being placed in the dissolution medium. Across formulations, buoyancy lag time ranged from 17 minutes to 58 minutes, indicating variations in the initial floating behavior of the tablets.

Total floating time represents the duration for which the tablet remains continuously buoyant on the dissolution medium without sinking. Total floating time ranged from 4 hours to 16 hours across formulations, reflecting differences in the sustained floating ability of the tablets.

These parameters are crucial for floating tablet formulations as they determine the onset and duration of floating, which directly influence drug release kinetics and gastric retention time. Optimizing these parameters ensures the desired therapeutic effect and enhances patient compliance by reducing dosing frequency.

Swelling index studies of floating Tablets

The table presents the swelling index ratio (%) of floating tablets (F1 to F7) at different time points (0, 2, 4, 6, and 8 hours) in the dissolution medium.

Table 5: Swelling index studies of floating Tablets

Time (hr)	Swelling index ratio (%)								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
0	0	0	0	0	0	0	0	0	0
2	31	33	44	42	52	53	51	49	38
4	48	42	55	54	58	65	63	59	49
6	54	55	56	64	68	73	75	69	65
8	49	50	57	56	58	63	64	62	57

At the initial time point (0 hours), all formulations exhibited a swelling index ratio of 0%, indicating no significant swelling immediately upon immersion in the dissolution medium.

As the time progressed, the swelling index increased gradually for all formulations. By the end of 8 hours, formulations F3, F4, F5, F6, and F7 demonstrated considerable swelling, with swelling index ratios ranging from 56% to 75%. Formulations F1 and F2 also exhibited swelling but to a lesser extent, with swelling index ratios ranging from 49% to 57%.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

These results indicate that the formulations underwent swelling over time when exposed to the dissolution medium. Swelling is a critical parameter for floating tablets as it contributes to gastric retention and drug release characteristics. The observed swelling behavior suggests the potential of these formulations for achieving prolonged gastric residence time and controlled drug release profiles, which are desirable for optimizing therapeutic outcomes.

% of Drug Release

The table illustrates the percentage of drug release from floating tablets (F1 to F9) at various time intervals (1, 2, 3, 4, 5, 6, 8, and 10 hours) in the dissolution medium.

At 1 hour, the percentage of drug release ranged from 9.2% (F7) to 17.8% (F1).

Table 6: % of Drug Release

TIME (hr)	% of Drug Release						
	F1	F2	F3	F4	F5	F6	F7
1	17.8	15.3	13.3	12.5	13.4	9.5	9.2
2	38.9	25.2	24.4	28.8	34.8	18.3	12.3
3	51.3	33.6	35.8	43.9	44.3	25.7	33.6
4	75.9	43.8	47.1	54.2	46.4	35.2	47.1
5	91.8	73.8	57.4	66.1	66.3	47.8	57.4
6	92.8	92.3	68.5	76.7	76.4	59.3	76.7
8	92.8	94.3	78.9	93.3	97.2	70.4	93.3
10	92.8	95.3	91.4	96.4	98.4	87.9	96.4

By 2 hours, there was a noticeable increase in drug release, with percentages ranging from 12.3% (F7) to 38.9% (F1).

At 3 hours, drug release further escalated, varying from 25.7% (F6) to 51.3% (F1).

By 4 hours, significant drug release was observed across all formulations, ranging from 35.2% (F6) to 75.9% (F1).

At 5 hours, drug release percentages ranged from 46.4% (F5) to 97.2% (F5), indicating substantial release from most formulations.

By 6 hours, the majority of formulations exhibited high drug release percentages, ranging from 59.3% (F6) to 92.8% (F1 and F5).

At 8 hours, drug release percentages ranged from 70.4% (F6) to 94.3% (F2).

Finally, at 10 hours, drug release percentages were consistently high, ranging from 87.9% (F6) to 98.4% (F5).

These results suggest that all formulations achieved substantial drug release within the tested time frame, with variations observed based on formulation composition and design. The data indicate the potential of these floating tablets for controlled and sustained drug release applications, with formulations exhibiting desirable release profiles for extended therapeutic effects.

V. CONCLUSION

The study successfully formulated and evaluated floating tablets of Piroxicam, demonstrating the effectiveness of the standard graph in quantifying Piroxicam concentrations. FTIR analysis confirmed the molecular integrity and compatibility of Piroxicam with excipients. Preformulation studies provided essential insights into the flow and compressibility of powdered blends, while post-compression parameters indicated robust tablet characteristics. Buoyancy and swelling index studies highlighted the formulations' potential for prolonged gastric residence and controlled drug release. The percentage drug release profiles confirmed the formulations' capability for sustained therapeutic efficacy.

REFERENCES

[1]. Singh, B. N., & Kim, K. H. (2000). Floating drug delivery systems: an approach to oral controlled drug delivery via gastric retention. *Journal of Controlled Release*, 63(3), 235-259.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, July 2024

[2]. Garg, R., & Gupta, G. D. (2008). Progress in controlled gastroretentive delivery systems. *Tropical Journal of Pharmaceutical Research*, 7(3), 1055-1066.

[3]. Streubel, A., Siepmann, J., & Bodmeier, R. (2006). Gastroretentive drug delivery systems. *Expert Opinion on Drug Delivery*, 3(2), 217-233.

[4]. Rouge, N., Buri, P., & Doelker, E. (1996). Drug absorption sites in the gastrointestinal tract and dosage forms for site-specific delivery. *International Journal of Pharmaceutics*, 136(1-2), 117-139.

[5]. Chawla, G., Gupta, P., Koradia, V., & Bansal, A. K. (2003). Gastroretention: a means to address regional variability in intestinal drug absorption. *Pharmaceutical Technology*, 27(7), 50-68.

[6]. Shah, S. H., Patel, J. K., & Patel, N. V. (2009). Stomach specific floating drug delivery system: a review. *International Journal of PharmTech Research*, 1(3), 623-633.

[7]. Deshpande, A. A., Shah, N. H., Rhodes, C. T., & Malick, A. W. (1996). Development of a novel controlled-release system for gastric retention. *Pharmaceutical Research*, 13(6), 815-819.

[8]. Jaimini, M., Rana, A. C., & Tanwar, Y. S. (2007). Formulation and evaluation of famotidine floating tablets. *Current Drug Delivery*, 4(1), 51-55.

[9]. Sharma, S., Pawar, A., & Sharma, P. (2004). Low density multiparticulate system for pulsatile release of meloxicam. *International Journal of Pharmaceutics*, 278(1), 49-57.

[10]. Rouge, N., Allemann, E., Gex-Fabry, M., Balant, L., Cole, E. T., Buri, P., & Doelker, E. (1998). Comparative pharmacokinetic study of a floating multiple-unit capsule, a high-density multiple-unit capsule and an immediate-release tablet containing 25 mg atenolol. *Pharmaceutical Research*, 15(4), 653-658.

[11]. Hirtz, J. (1985). The gastrointestinal absorption of drugs in man: a review of current concepts and methods of investigation. *British Journal of Clinical Pharmacology*, 19(S2), 77S-83S.

[12]. Arora, S., Ali, J., Ahuja, A., Khar, R. K., & Baboota, S. (2005). Floating drug delivery systems: a review. *AAPS PharmSciTech*, 6(3), E372-E390.

[13]. Sharma, R., & Awasthi, R. (2020). Floating drug delivery system: A review. *Journal of Drug Delivery and Therapeutics*, 10(1), 107-115.

[14]. Baumgartner, S., Kristl, J., Vrečer, F., Vodopivec, P., & Zorko, B. (2000). Optimization of floating matrix tablets and evaluation of their gastric residence time. *International Journal of Pharmaceutics*, 195(1-2), 125-135.

[15]. Mojaverian, P., Ferguson, R. K., Vlasses, P. H., Rocci Jr, M. L., Oren, A., Fix, J. A., & Caldwell, L. J. (1985). Estimation of gastric residence time of the Heidelberg capsule in humans: effect of varying food composition. *Gastroenterology*, 89(2), 392-397.

[16]. Rosa, M., Zia, H., & Rhodes, T. (1994). Dosing and testing in vitro of a bioadhesive and floating drug delivery system for oral application. *International Journal of Pharmaceutics*, 105(1), 65-70.