CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187
https://doi.org/10.5281/zenodo.24098180

Available online at: http://www.iajps.com Research Article

FORMULATION AND *IN VITRO* EVALUATION OF GASTRO RETENTIVE FLOATING TABLETS OF RANOLAZINE BY USING NATURAL POLYMERS

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Abstract:
The present study aimed to formulate and evaluate gastro-retentive floating tablets of ranolazine using natural polymers to enhance gastric residence time and achieve sustained drug release. Floating matrix tablets were prepared by direct compression employing various natural polymers as release-retarding agents. The prepared powder blends were evaluated for pre-compression parameters including angle of repose, bulk density, tapped density, Carr's index, and Hausner's ratio, which indicated satisfactory flow and compressibility. The compressed tablets were further assessed for post-compression parameters such as weight variation, hardness, thickness, friability, drug content, floating lag time, total floating duration, and in-vitro dissolution studies. All formulations complied with Indian Pharmacopoeia (IP) limits, confirming acceptable tablet quality.
Among the developed formulations, R5 was identified as the optimized formulation based on buoyancy characteristics and drug release behaviour. The R5 formulation exhibited a short floating lag time with prolonged floating duration and demonstrated 99.77% drug release over 12 hours, showing superior sustained release compared to other formulations. The results suggest that natural polymers can effectively be utilized in the development of gastro-retentive floating tablets of ranolazine, providing controlled drug release and potential improvement in therapeutic efficacy.
Keywords: *Ranolazine, HPMC, Xanthan Gum and Guar Gum*

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Please cite this article in press ***Velpula Leena*** *et al.,* ***Formulation And In Vitro Evaluation Of Gastro Retentive Floating Tablets Of Ranolazine By Using Natural Polymers.,****. Indo Am. J. P. Sci, 2026; 13(11).*

INTRODUCTION:

Gastroretentive drug delivery systems are designed to be retained in the stomach for a prolonged time and release their active ingredients and thereby enable sustained and prolonged input of the drug to the upper part of the gastrointestinal tract. A modified release drug delivery system with prolonged residence time in the stomach is of particular interest for drugs- acting locally in the stomach; having an absorption window in the stomach or in the upper part of small intestine; those unstable in the intestinal or colonic environments; or those having low solubility at high pH values.[1,2]

To formulate a successful gastroretentive drug delivery system, several techniques are currently used such as floating drug delivery system, low density systems, raft systems incorporating alginate gel, bio adhesive or mucoadhesive system ms, high density systems, superporous hydrogel and magnetic system. Among these, the floating dosage forms have been most commonly used. Floating drug delivery systems have a bulk density less than gastric fluids and so remain buoyant in the stomach without affecting the gastric emptying rate for a prolonged period of time. While the system is floating on the gastric contents, the drug is released slowly at the desired rate from the system. After release of drug, the residual system is emptied from the stomach. This results in an increased gastric retention time and control of the fluctuation in plasma drug concentration.[3,4]

Floating tablet is a class of gastro retentive drug delivery system. Gastro retentive systems are able to increase residence time of dosage forms in the stomach there by increases the bioavailability of drugs with narrow absorption window, drugs Which contain less water solubility in alkaline pH of small intestine or drugs with poor stability in the intestinal or colonic environment.

What are floating tablets?

Floating tablets are a type of **gastro-retentive drug delivery system (GRDDS)** designed to remain buoyant in the gastric (stomach) fluid for an extended period, thereby **prolonging the gastric residence time** of the dosage form.

Why is this useful?

Many drugs benefit from extended retention in the stomach/upper small intestine because:

- They are absorbed primarily in the stomach or upper small intestine.
- They are unstable or poorly soluble in the higher pH of the intestines.
- They need controlled release to maintain therapeutic levels and reduce dosing frequency.

Why Floating Tablets Are Important

Conventional oral dosage forms pass quickly through the gastrointestinal tract, which can limit the **absorption** of certain drugs. Floating tablets overcome this by remaining in the stomach for extended periods, allowing for:

- **Sustained drug release**
- **Improved absorption**
- **Better therapeutic outcomes**

By designing a tablet that floats (i.e., has a lower density than the gastric fluid), one can delay its passage through the pylorus and hence extend its contact time in the stomach.

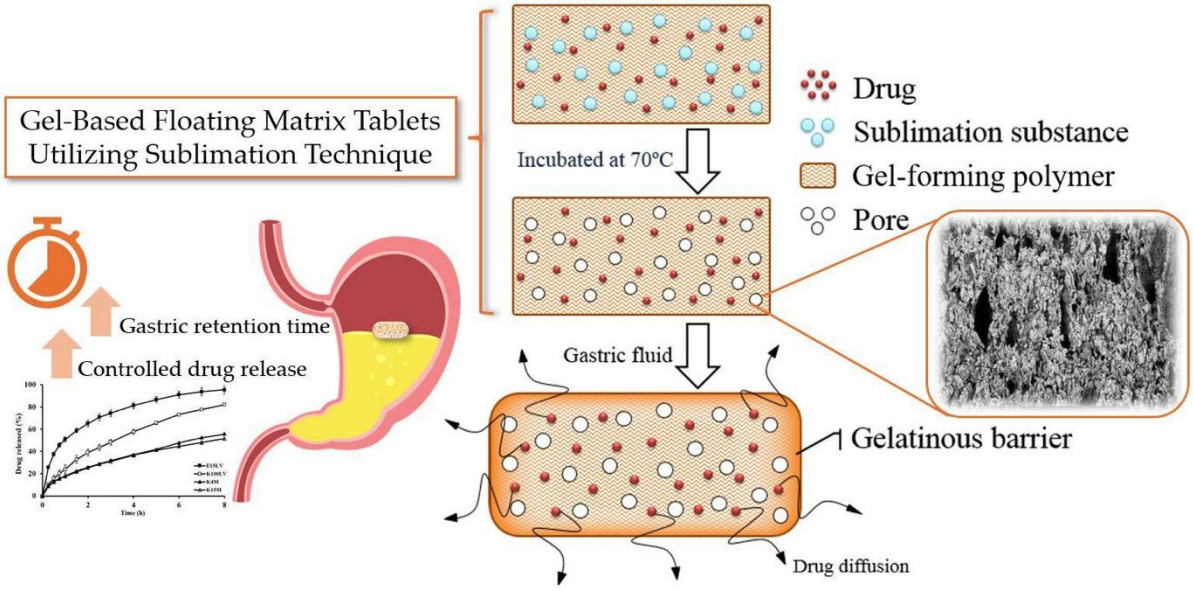

Figure No : 1.1 Classification of Floating tablets

Floating tablets are classified depending on the use of 2 formulation variables: effervescent and non-effervescent system.

Effervescent Floating tablets: These are matrix types of systems prepared with the help of swellable polymers such as methylcellulose and chitosan and various effervescent compounds, e.g., sodium bicarbonate, tartaric acid, and citric acid. They are formulated in such a way that when in contact with the acidic gastric contents, CO2 is liberated and gets entrapped in swollen hydrocolloids, which provides buoyancy to the dosage forms.

Floating lag time and total floating time

Floating lag time (FLT) and total floating time (TFT) of floating tablets were measured visually in dissolution apparatus type II containing100 mL 0.1 N HCl with a paddle rotated at 50 rpm (pH 1.2) at 37 ± 0.5 °C

METHODOLOGY:

Analytical method Development:

a) Determination of absorption maxima:

A solution containing the concentration 10µg/ml drug was prepared in 0.1N HCL UV Spectrum was taken using double beam UV/VIS Spectrophotometer. The Solution was scanned in the range of 400-800nm.

a) Preparation calibration curve:

10mg Ranolazine pure drug was dissolved in 10ml of methanol (stock solution 1) from stock solution 1ml of solution was taken and made up with 10ml of 0.1N HCL (100µg/ml). From this 1ml was taken and made up with 10ml of 0.1N HCL (10µg/ml). The above solution was subsequently diluted with 0.1N HCL to obtain series of dilutions containing 10, 20, 30, 40, 50µg/ml of per ml of solution. The absorbance of the above dilutions was measured at 261 nm by using UV-Spectrophotometer taking 0.1N HCL as blank. Then a graph was plotted by taking concentration on X-Axis and absorbance on Y-Axis which gives a straight-line linearity of standard curve was assessed from the square of correlation coefficient ($R^{2)}$ Which determined by least-square linear regression analysis.

Pre formulation parameters

The quality of tablet, once formulated by rule, is generally dictated by the quality of physicochemical properties of blends. There are many formulations and process variables involved in mixing and all these can affect the characteristics of blends produced. The various characteristics of blends tested as per pharmacopoeia.

Angle of repose:

The frictional force in a loose powder can be measured by the angle of repose. It is defined as, the maximum angle possible between the surface of the pile of the powder and the horizontal plane. If more powder is added to the pile, it slides down the sides of the pile until the mutual friction of the particles producing a surface angle, is in equilibrium with the gravitational force. The fixed funnel method was employed to measure the angle of repose. A funnel was secured with its tip at a given height (h), above a graph paper that is place on a flat horizontal surface. The blend was carefully pored through the funnel until the apex of the conical pile just touches the tip of the funnel. The radius (r) of the base of the conical pile was measured. The angle of repose was calculated using the following formula:

Tan θ= h/r

Tan θ=Angle of repose

h= Height of the cone,

r= radius of the cone base

Table 7.1: Angle of repose values (as per USP)

Angle of Repose	Nature of Flow
<25	Excellent
25-30	Good
30-40	Passable
>40	Very poor

Bulk density:

Density is defined as weight per unit volume. Bulk density, is defined as the mass of the powder divided by the bulk volume and is expressed as gm/cm^3. The bulk density of a powder primarily depends on particle size distribution, particle shape and the tendency of particles to adhere together. Bulk density is very important in size of containers needed for handling, shipping, and storage of raw material and blend. It is also important in size blending equipment. 10gm powder blend was sieved and introduced into a dry 20ml cylinder, without compacting. The

powder was carefully leveled without compacting and the unsettled apartment volume, Vo, was read.
The bulk density was calculated using the formula:
Bulk density= M/Vo
Were,
M= Weight of sample
Vo=Apparent volume of powder

Tapped density:
After carrying out the procedure as given in the measurement of bulk density the cylinder containing the sample was tapped using a suitable mechanical tapped density tester that provides 100 drops per minute and this was repeated until difference between succeeding measurement is less than 2% and then tapped volume, V Measured, to the nearest graduated unit. The tapped density was calculated, in gm per L, using the formula:
Tap= M/V
Where, Tap=Tapped density
M=Weight of sample
V=Tapped volume of powder

Measures of powder compressibility:
The compressibility index (Carr's index) is a measure of the propensity of a powder to be compressed. It is determined from the bulk and tapped densities. In theory, the less compressible a material the more flowable it is. As such, it is measures of the relative importance of inter particulate interactions. In a free- flowing powder, such interactions are generally less significant, and the bulk tapped densities will be closer in value.
For poorer flowing materials, there are frequently greater inter particle interactions, and a greater difference between the bulk and tapped densities will be observed. These differences are reflected in the compressibility index which is calculated using the following formulas:
Carr's index = [(tap-b/tap] ×100
Were,
B=Bulk density
Tap= Tapped density

Table 7.2: Carr's index value (as per USP)

Carr's index	Properties
5 – 15	Excellent
12 – 16	Good
18 – 21	Fair to Passable
2 – 35	Poor
33 – 38	Very Poor
>40	Very Very Poor

7.3 Formulation development of floating tablets:
Procedure of direct compression method:

1. Drug and all other ingredients were individually passed through sieve no ≠ 60.
2. All the ingredients were mixed thoroughly by triturating up to 15min.
3. The powder mixture was lubricated with talc.
4. The tablets were prepared by using direct compression method by using 7mm punch.

FORMUALTION OF TABLETS:

Table 7.3: Formulation composition for floating tablets

Ingredients	R1	R2	R3	R4	R5	R6	R7	R8	R9
Ranolazine	100	100	100	100	100	100	100	100	100
HPMC	50	100	150	-	-	-	-	-	-
Xanthan Gum	-	-	-	50	100	150	-	-	-
Guar Gum	-	-	-	-	-	-	50	100	150
Sodium bicarbonate	25	25	25	25	25	25	25	25	25
Citric acid	15	15	15	15	15	15	15	15	15

Talc	10	10	10	10	10	10	10	10	10
Magnesium stearate	10	10	10	10	10	10	10	10	10
MCC	290	240	190	290	240	190	290	240	190
Total weight	500	500	500	500	500	500	500	500	500

All the quantities were in mg

Evaluation of post compression parameters for prepared Tablets

The designed compression tablets were studied for their physicochemical properties like weight variation, hardness, thickness, friability and drug content.

Weight variation test:

To study the weight variation, twenty tablets were taken and their weight was determined individually and collectively on a digital weighing balance. The average weight of one tablet was determined from the collective weight. The weight variation test would be satisfactory method of determining the drug content uniformity. Not more than two of the individual weights deviate from the average weight by more than the percentage shown in the following table and none deviate by more than twice the percentage. The mean and deviation were determined. The percent deviation was calculated using the following formula.

% Deviation = (Individual weight- Average weight/Average weight) × 100

Table 7.4: Pharmacopoeial specifications for tablet weight variation

Average weight of tablet (mg) (I.P)	Average weight of tablet (mg) (U.S.P)	Maximum percentage difference allowed
Less than 80	Less than 130	10
80-250	130-324	7.5
More than	More than 324	5

Hardness:

Hardness of tablet is defined as the force applied across the diameter of the tablet in order to break the tablet. The resistance of the tablet to chipping, abrasion or breakage under condition of storage transformation and handling before usage depends on its hardness. For each formulation, the hardness of three tablets was determined using Monsanto hardness tester and the average is calculated and presented with deviation.

Thickness:

Tablet thickness is an important characteristic in reproducing appearance. Tablet thickness is an important characteristic in reproducing appearance. Average thickness for core and coated tablets is calculated and presented with deviation.

Friability:

It is measured of mechanical strength of tablets. Roche Friabilator was used to determine the friability by following procedure. Pre weighed tablets were placed in the Friabilator. The tablets were rotated at 25 rpm for 4 minutes (100 rotations). At the end of test, the tablets were re-weighed, and loss in the weight of tablet is the measure of friability and is expressed in percentage as

% Friability = [(W1-W2)/W1] ×100

Were,

W1=Initial weight of tablets

W2=Weight of the tablets after testing

Determination of drug content:

Both compression-coated tablets of were tested for their drug content. Ten tablets were finely powdered quantities of the powder equivalent to one tablet weight of Ranolazine were accurately weighed, transferred to a 100ml volumetric flask containing 50ml water and were allowed to stand to ensure complete solubility of the drug. The mixture was made up to volume with water. The solution was suitably and the absorption was determined by UV-Visible spectrophotometer. The drug concentration was calculated from the calibration curve.

***In vitro* buoyancy studies:**

The *in vitro* buoyancy was determined by floating lag time, and total floating time. (As per the method described by Rosa et al) 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 lag time (FLT) and duration of time the tablet constantly floats on the dissolution medium was noted as total floating time respectively (TFT).

***In vitro* drug release studies**

Dissolution parameters:

Apparatus --USP-II, Paddle method

Dissolution medium --0.1N HCL

RPM --50

Sampling intervals(hrs) -- 0,0.5,1,2,3,4,5,6,7,8,9,10,11,12

Temperature --37˚c±0.5˚c

As the preparation was for floating drug release given through oral route of administration, different receptors fluids are used for evaluation the dissolution profile.

Procedure:

900ml of 0.1 HCL was placed in vessel and the USP apparatus-II (Paddle method) was assembled. The medium was allowed to equilibrate to temp of 37˚c±0.5˚C. Tablet was placed in the vessel and the vessel was covered the apparatus was operated for 24 hrs at 50rpm. At definite time intervals of 5 ml of the receptor's fluid was continued from 0 to 24 hrs at 50rpm. At definite time intervals of 5 ml of the receptor's fluid was withdrawn, filtered and again 5ml receptor fluid was replaced. Suitable dilutions were done with media and analysed by spectrophotometrically at 261 nm using UV-Spectrophotometer.

7.5 Application of release rate kinetics to dissolution data:

Various models were tested for explaining the kinetics of drug release. To analyse the mechanism of the drug release rate kinetics of the dosage form, the obtained data were fitted into zero-order, first order, Higuchi, and Kors Meyer Peppas release model.

Zero order release rate kinetics:

To study the zero-order release kinetics the release rate data are fitted to the following equation.

F=Ko t

Where, F is the drug release at time"t", and "Ko" is the zero order release rate constant. The plot of % drug release versus time is linear.

First order release rate kinetics: The release rate data are fitted to the following equation

Log(100-F) =kt

A plot of log cumulative percent of drug remaining to be released vs. Time is plotted then it gives first order release.

Higuchi release model:

To study the Higuchi release kinetics, the release rate data fitted to the following equation.

F=kt1/2

Where, 'k' is the Higuchi constant.

In Higuchi model, a plot of %drug release versus square root time is linear.

Korsmeyer and Peppas release model:

The mechanism of drug release was evaluated by plotting the log percentage of drug released versus log time according to Korsmeyer-Peppas equation. The exponent 'n' indicates the mechanism of drug release calculated through the slope of the straight line.

$M_t/M_\infty=Kt^n$

Where, M_t/M_∞ is fraction of drug released at time 't',k represents a constant, and 'n' is the diffusional exponent, which characterizes the type of release mechanism during the dissolution process. For non-Fickian release, the value of n fallas between 0.5 and 1.0; while in case of Fickian diffusion, n=0.5; for zero-order release (case II transport), n=1; and for super case II transport, n>1. In this model, a plot of log (M_t/M_∞) versus log (time) is linear.

Drug – excipients compatibility studies

Fourier transform infrared (FTIR) Spectroscopy:

The compatibility between the pure drug and excipients was detected by FTIR Spectra obtained on Bruker FTIR Germany (alpha T). The solid powder directly place on yellow crystal which was made up of ZnSe. The spectra were recorded over the wave number of 4000cm^{-1} to 550cm^{-1}.

RESULTS AND DISCUSSION:

Analytical

Method

a. calibration curve

The standard curve is based on the spectrophotometry. The maximum absorption was observed at 261 nm. Graphs of Ranolazine was taken in 0.1N HCL (pH 1.2)

Table 8.1: Observations for graph of Ranolazine in 0.1N HCL

Concentration (µg/ml)	Absorbance
0	0
10	0.141

20	0.285
30	0.431
40	0.564
50	0.702

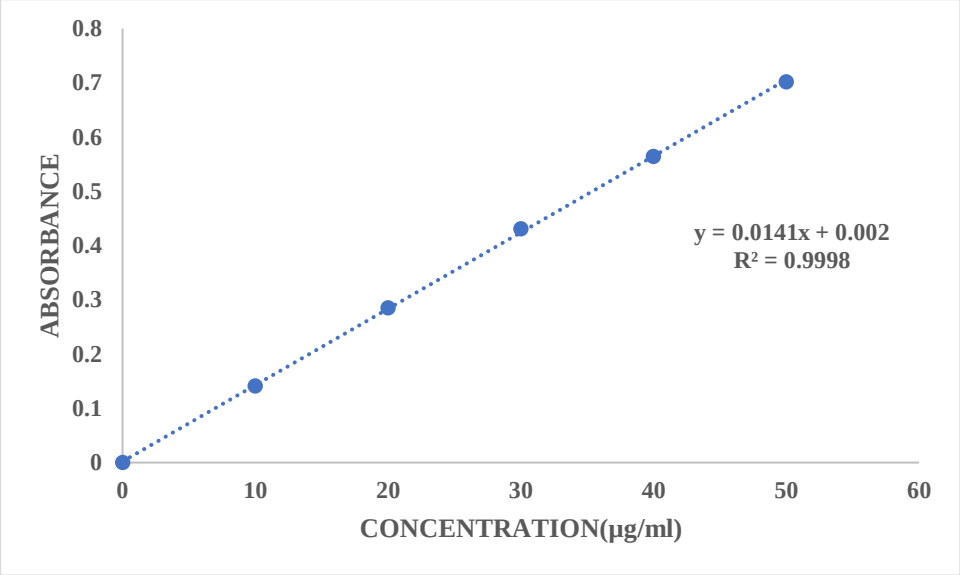

Figure 8.1: Standard graph of Ranolazine in 0.1N HCL

Standard graph of Ranolazine was plotted as per the procedure in experimental method and its linearity is shown in table 8.1 and fig 8.1. The standard graph of Ranolazine showed good linearity with R^2 of 0.998, which indicates that it obeys "Beer-Lamberts" law.

Preformulation parameters of powder blend:

Table 8.2: Pre-formulation parameters of blend

Formulation code	Bulk density* (g/cm3)	Tapped density *(g/cm3)	Compressibility Index (CI)* (%)	Hausner's ratio*	Angle of repose* (θ)
R1	0.461	0.573	19.546	1.243	32.00
R2	0.452	0.579	21.934	1.281	33.23
R3	0.468	0.587	20.273	1.254	26.36
R4	0.469	0.589	20.374	1.256	26.56
R5	0.465	0.585	20.513	1.258	28.43
R6	0.461	0.590	21.864	1.280	30.23
R7	0.462	0.587	21.295	1.271	29.74

R8	0.459	0.581	20.998	1.266	25.33
R9	0.456	0.585	22.051	1.283	25.11

Tablet powder blend was subjected to various pre-formulation parameters. The angle of repose values indicates that the powder blend has good flow properties. The bulk density of all the formulations was found to be in the range 0.452 to 0.469 (gm/ml) showing that the powder has good flow properties. The tapped density of all the formulations was found to be in the range of 0.573 to 0.590 showing the powder has good flow properties. The compressibility index of all the formulations was found to be below 14.28 which show that the powder has good flow properties. All the formulations have shown the Hausner's ratio ranging between 1.243 to 1.283 indicating the powder has good flow properties.

8.5. Quality control parameters for tablets:

Tablet quality control tests such as weight variation, hardness, and friability, thickness, drug content and drug release studies were performed for floating tablets.

Table 8.3: *In vitro* quality control parameters

Formulation code	Weight variation (mg)	Hardness (kg/cm^2)	Friability (%loss)	Thickness (mm)	Drug content (%)	Floating Lag time (Seconds)	Total floating time (Hours)
R1	498.12	5.54	0.26	3.27	99.38	60	12
R2	499.85	5.38	0.35	3.61	98.43	85	12
R3	501.63	5.62	0.41	3.39	97.89	77	12
R4	499.72	5.44	0.53	3.45	99.88	89	12
R5	500.36	5.49	0.29	3.36	99.63	66	12
R6	499.93	5.51	0.33	3.55	98.73	69	12
R7	498.78	5.58	0.46	3.49	97.22	72	12
R8	501.22	5.39	0.49	3.51	98.96	83	12
R9	497.12	5.41	0.38	3.39	99.82	79	12

All the parameters such as weight variation, friability, hardness, thickness, drug content were found to be within limits.

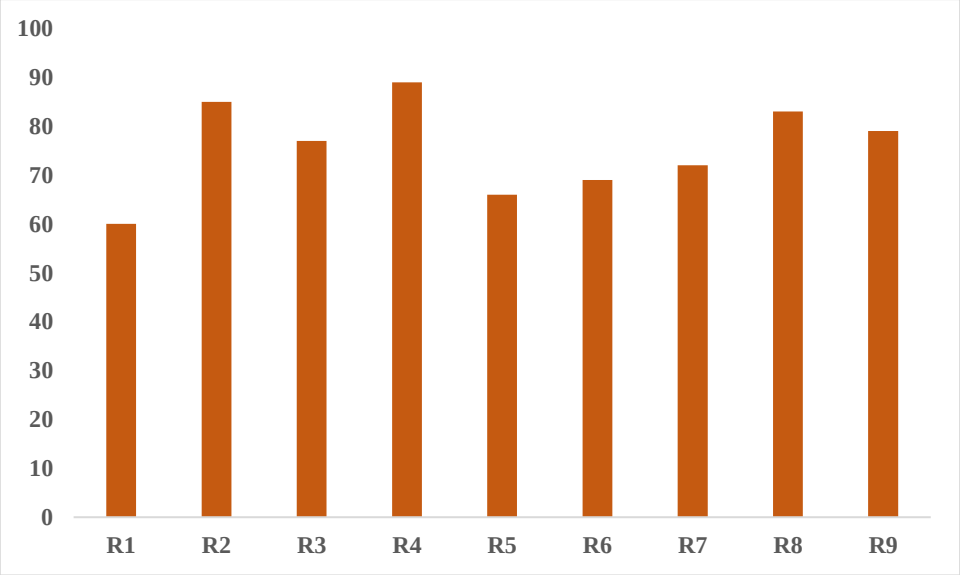

Figure 8.2: Floating Lag time (Seconds)

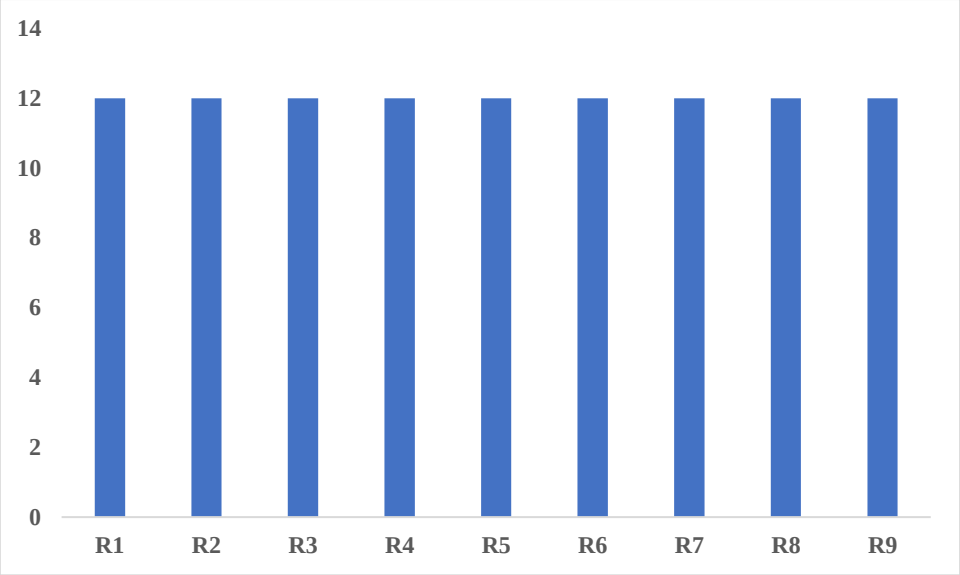

Figure 8.3: Total floating time (Hours)

8.6. *In Vitro* drug release studies

Table 8.4: Dissolution data of floating tablets

Time (hrs)	R1	R2	R3	R4	R5	R6	R7	R8	R9
0	0	0	0	0	0	0	0	0	0
0.5	16.24	15.08	14.55	16.56	14.33	16.92	12.31	16.88	19.63
1	21.96	24.96	22.96	18.65	15.64	25.66	17.64	18.02	25.95
2	26.98	38.35	29.53	22.08	21.79	28.52	23.29	28.95	39.43
3	31.47	43.65	38.49	27.75	25.82	35.43	29.98	38.16	43.06
4	38.66	49.62	42.24	38.13	31.62	39.85	32.12	49.07	56.56
5	47.38	57.86	51.48	43.53	37.05	42.16	38.53	56.39	64.36
6	53.85	61.56	55.59	47.99	45.66	48.08	49.77	64.46	72.43
7	59.65	69.68	62.43	59.65	49.39	53.96	57.25	75.73	79.95
8	62.92	72.25	68.06	65.48	56.08	61.42	66.85	79.86	86.93
9	69.83	78.32	72.25	79.33	68.62	72.55	79.46	83.15	88.76
10	73.08	82.75	77.32	89.65	77.29	83.34	83.09	87.33	93.66
11	76.88	88.62	81.88	94.87	88.46	92.48	89.74	93.46	96.53
12	85.63	95.59	91.15	97.57	99.77	96.24	92.66	97.55	98.34

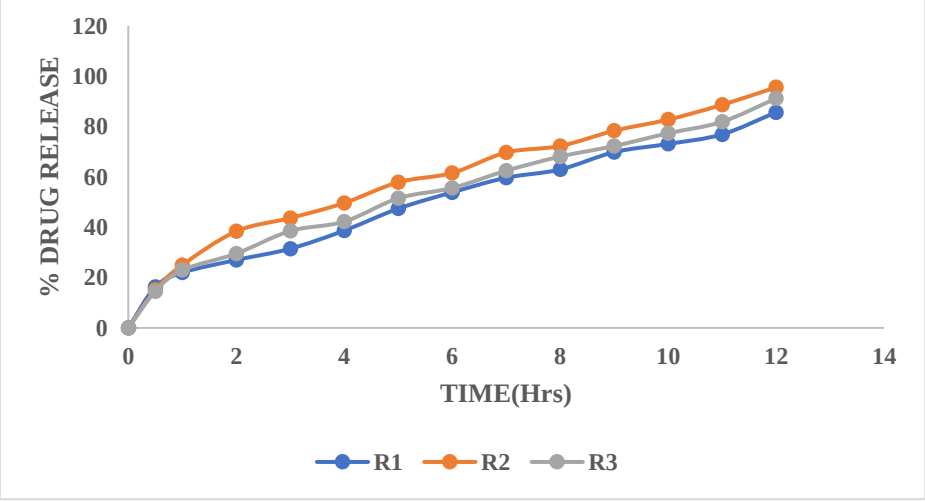

Fig 8.4: Dissolution data of Ranolazine floating tablets HPMC

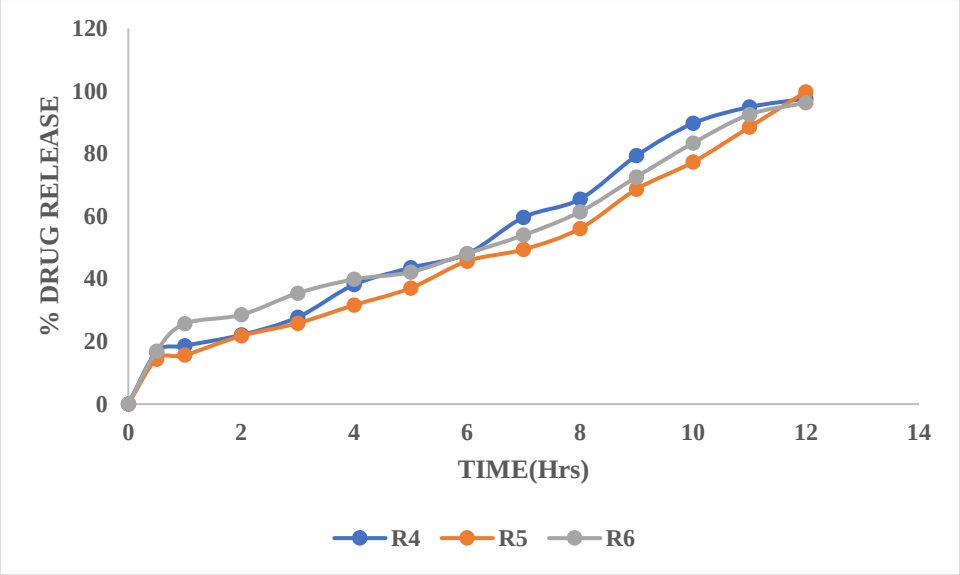

Fig 8.5: Dissolution data of Ranolazine floating tablets containing Xanthan Gum

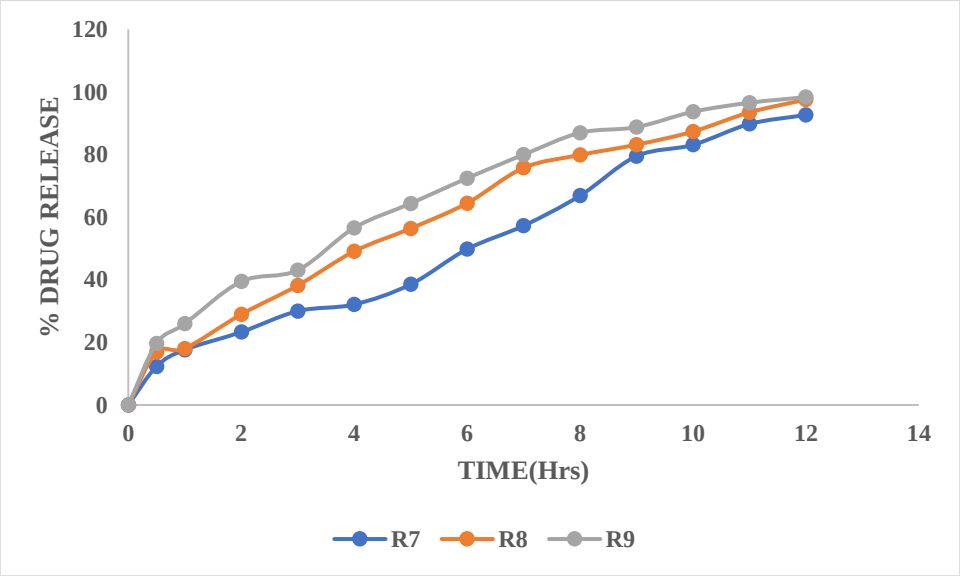

Fig 8.6: Dissolution data of Ranolazine floating tablets containing Guar Gum

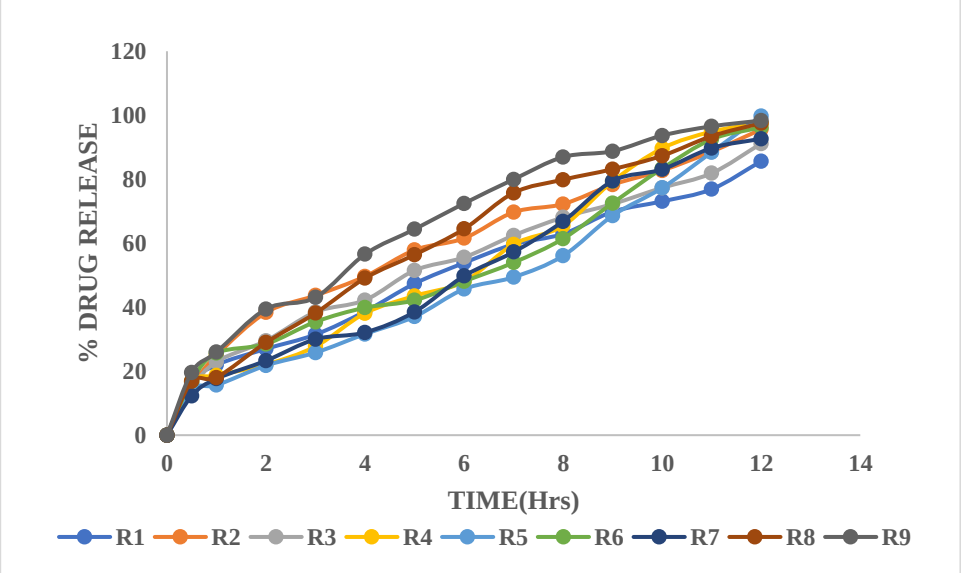

Fig 8.7: Dissolution data of Ranolazine floating tablets containing all formulations

From the above graphs it was evident that HPMC in the concentration of 100mg of polymer of the total tablet weight (R2) drug with other Two Formulations R1, R2. Where as in R3 formulation the quantity of polymer was high hence it showed more drug retardation with more drug release that is 95.59 % in 12 hrs.

From the above graphs it was evident that Xanthan Gum in the Polymer concentration of 100mg (R5), is showing better result 99.77% drug release when compared with other 2 formulations R5As the concentration of polymer increases the retarding of drug release decreased.

From the above graphs it was evident that Guar Gum in the Polymer concentration 150mg formulation (R9) is showing better result 98.34% drug release when compared with other two formulations. Where as in R7, R8formulations the concentration becomes low and the drug release was less.

Hence from the above dissolution data it was concluded that R5 formulation was considered as optimized formulation because good drug release (99.77%) in 12 hours.

Application of release rate kinetics to dissolution data for optimised formulation:

Table 8.5: Application kinetics for optimised formulation

CUMULATIVE (%) RELEASE Q	TIME (T)	ROOT (T)	%) REL	LOG (T	LOG (%) REMAIN	RELEASE RATE (CUMULATIVE % RELEASE / t)	1/CUM% RELEASE	PEPPAS log Q/100	% Drug Remaining	Q01/3	Qt1/3	Q01/3-Qt1/3
0	0	0	0	0	0	0	0	0	0	0	0	0
14.33	0.5	0.707	0.841	0.917	0.958	0.979	0.989	0.995	0.997	0.999	0.999	-0.001
15.64	1	1.000	1.194	0.000	1.926	15.640	0.0639	-0.806	84.36	4.642	4.386	0.256
21.79	2	1.414	1.338	0.301	1.893	10.895	0.0459	-0.662	78.21	4.642	4.276	0.365
25.82	3	1.732	1.412	0.477	1.870	8.607	0.0387	-0.588	74.18	4.642	4.202	0.440
31.62	4	2.000	1.500	0.602	1.835	7.905	0.0316	-0.500	68.38	4.642	4.089	0.552
37.05	5	2.236	1.569	0.699	1.799	7.410	0.0270	-0.431	62.95	4.642	3.978	0.664
45.66	6	2.449	1.660	0.778	0.389	7.610	0.0219	-0.340	54.34	4.642	3.788	0.854
49.39	7	2.646	1.694	0.845	0.423	7.056	0.0202	-0.306	50.61	4.642	3.699	0.943
56.08	8	2.828	1.749	0.903	0.452	7.010	0.0178	-0.251	43.92	4.642	3.528	1.113
68.62	9	3.000	1.836	0.954	0.477	7.624	0.0146	-0.164	31.38	4.642	3.154	1.487
77.29	10	3.162	1.888	1.000	0.500	7.729	0.0129	-0.112	22.71	4.642	2.832	1.810
88.46	11	3.317	1.947	1.041	0.521	8.042	0.0113	-0.053	11.54	4.642	2.260	2.382
99.77	12	3.464	1.999	1.079	0.540	8.314	0.0100	-0.001	0.23	4.642	0.613	4.029

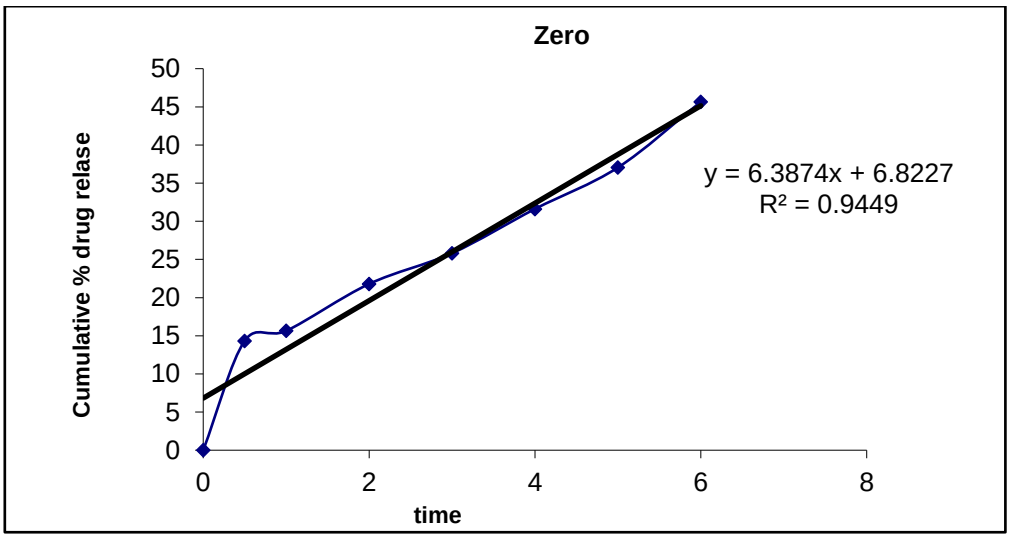

Fig 8.8 : Zero order release kinetics

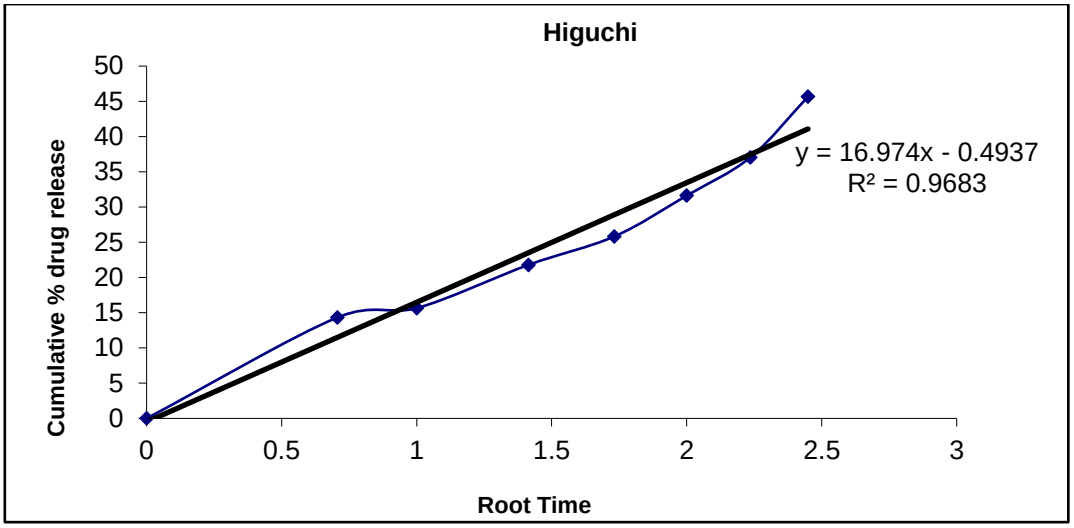

Fig 8.9 : Higuchi release kinetics

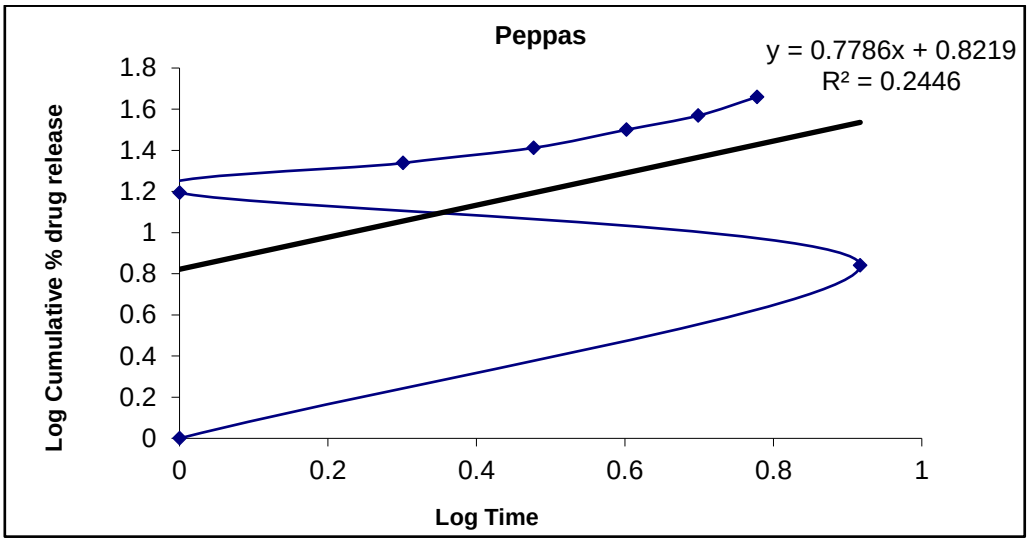

Fig 8.10 : Kors mayer peppas release kinetics

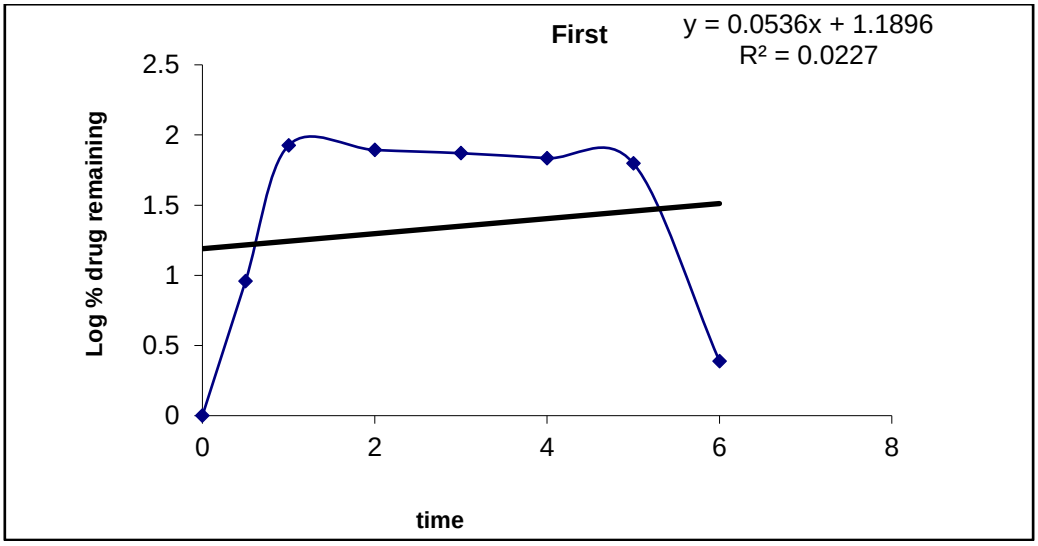

Fig 8.11 : First order release kinetics

Optimized formulation R5 was kept for release kinetics studies. From the above graphs it was evident that the formulation R5 was followed Zero order release.

Drug – Excipient compatibility studies
Fourier Transform – Infrared Spectroscopy

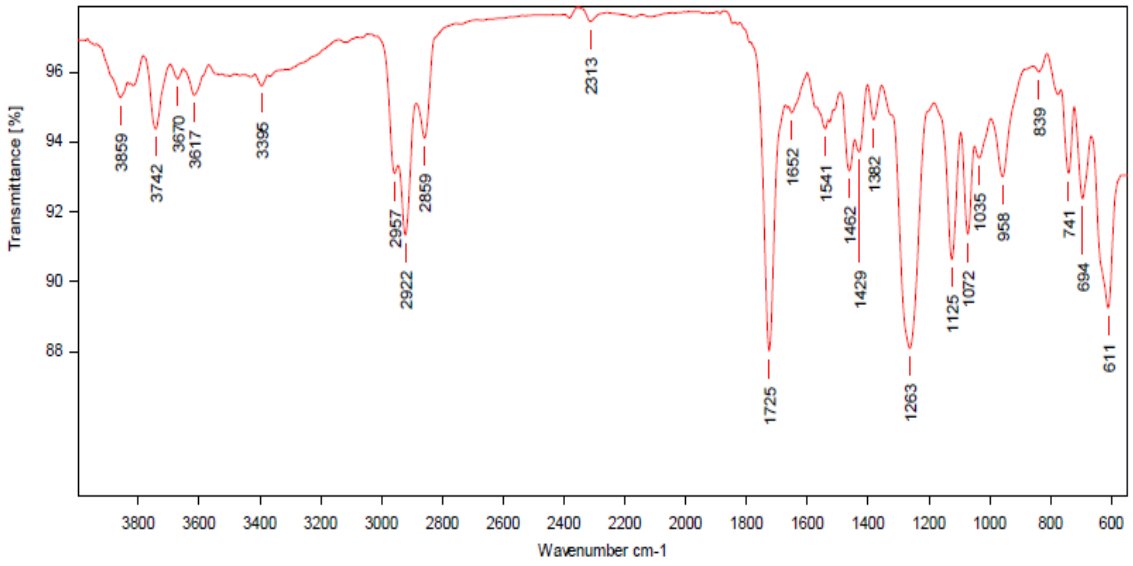

Fig 8.12 :FTIR Spectrum of pure drug

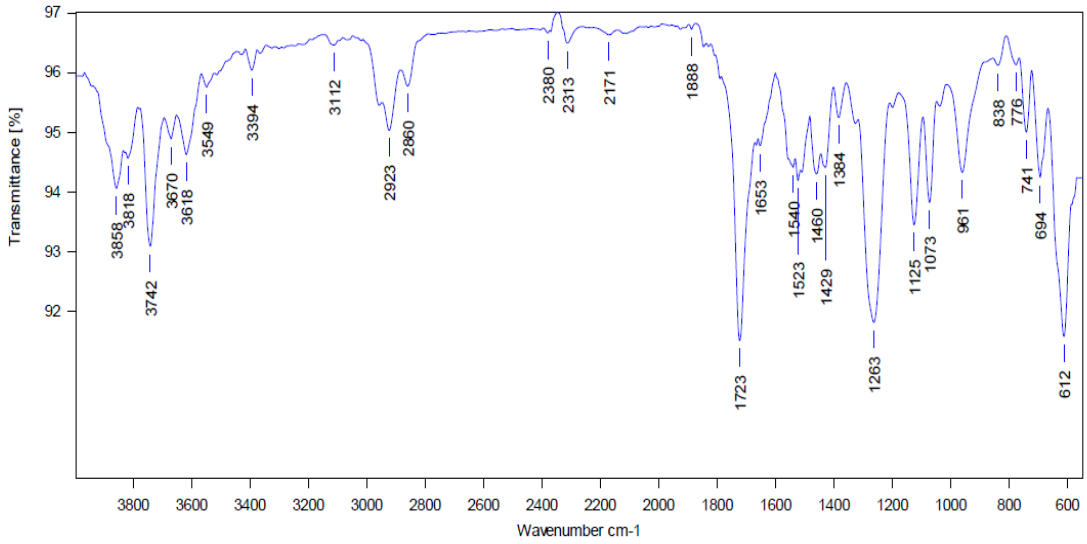

Fig 8.13: FTIR Spectrum of optimized formulation

There was no disappearance of any characteristics peak in the FTIR spectrum of drug and the polymers used. This shows that there is no chemical interaction between the drug and the polymers used. The presence of peaks at the expected range confirms that the materials taken for the study are genuine and there were no possible interactions.

Ranolazine is also present in the physical mixture, which indicates that there is no interaction between drug and the polymers, which confirms the stability of the drug.

CONCLUSION:

The present study successfully formulated gastro-retentive floating tablets of Ranolazine using natural polymers with the objective of prolonging gastric residence time and achieving sustained drug release. The prepared formulations were evaluated for pre-compression parameters such as angle of repose, bulk density, tapped density, Carr's index, and Hausner ratio, which indicated good flow properties suitable for tablet compression. Post-compression evaluation showed that hardness, thickness, friability, weight variation, drug content, floating lag time, total floating time, and in-vitro dissolution parameters were all within the acceptable limits specified by the Indian Pharmacopoeia (IP).

The formulated tablets demonstrated satisfactory buoyancy with minimal floating lag time and prolonged floating duration, confirming their gastro-retentive nature. In-vitro drug release studies revealed a controlled and sustained release profile of

Ranolazine, indicating the effective role of natural polymers in modulating drug release and maintaining matrix integrity.

Overall, the study concludes that natural polymers can be successfully employed in the formulation of gastro-retentive floating tablets of Ranolazine, providing a promising approach for improving drug bioavailability, reducing dosing frequency, and enhancing therapeutic efficacy.

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