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FORMULATION AND EVALUATION OF CILINIDIPINE FLOATING TABLETS

Katika Harika*, Dr. A. Yasodha and Dr. D. Avinash

M. Pharmacy, Department of Pharmaceutics, Dhanvantari College of Pharmacetical Sciencee, Mahabub Nagar, Telangana, India.

***Corresponding Author: Katika Harika**

M. Pharmacy, Department of Pharmaceutics, Dhanvantari College of Pharmacetical Sciencee, Mahabub Nagar, Telangana, India.

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ABSTRACT

The main objective of the present study was to develop floating formulation containing 250 mg of Cilinidipine for twice therapy using natural polymers like xanthan gum and guar gum. GRDDS improved the bioavailability and therapeutic efficiency of drug. The formulations were prepared by direct compression method. The angle of repose values for formulations ranges from 25.04±0.02 to27.10 ±0.06. Bulk and tapped densities were used for the measurement of compressibility index. The bulk and tapped values for formulations range from 0.25±0.05 to 0.33±0.04 and 0.32±0.04 to 0.38±0.02 respectively the car's index and harusner's ratio values for formulations range from 1.05±0.03 to 1.37±0.05 respectively. Thus, all formulations exhibited good flow characteristics. Compared to all formulations F4 showed the best buoyancy lag time, the buoyancy lag time for F4 was found to be 45sec. Total floating time of all formulations was found to be >8 hrs. The formulation containing xanthan gum shows the higher swelling compared to that of the formulations containing both xanthan and guar gum alone. From the above study, concluded that F4 was the optimized formulation whichhas shown better buoyancy time 45sec and drug release 99.80% in 8hrs. However, further *invivo* studies can be carried out to support the results. The overall results explained that the tablets prepared by combination of xanthan gum and guar gum could be more effective on floating tablets and has shown more sustained effect than floating tablets containing natural polymer alone.

KEYWORDS: Formulation, Evaluation, Cilinidipine, Floating Tablets.

INTRODUCTION

Gastric emptying of dosage forms is an extremely variable process and ability to prolong and control the emptying time is a valuable asset for dosage forms, which reside in the stomach for a longer period of time than conventional dosage forms. Several difficulties are faced in designing controlled release systems for better absorption and enhanced bioavailability. One of such difficulties is the inability to confine the dosage form in the desired area of the gastrointestinal tract. Drug absorption from the gastrointestinal tract is a complex procedure and is subject to many variables. It is widely acknowledged that the extent of gastrointestinal tract drug absorption is related to contact time with the small intestinal mucosa.[1] Thus, small intestinal transit time is an important parameter for drugs that are incompletely absorbed. Basic human physiology with the details of gastric emptying, motility patterns, and physiological and formulation variables affecting the cosmic emptying are summarized. Gastroretentive systems can remain in the gastric region for several hours and hence significantly prolong the gastric residence time of drugs. Prolonged gastric retention improves bioavailability, reduces drug waste, and improves solubility for drugs that are less soluble in a high pH environment. It has applications also for local drug delivery to the stomach and proximal small intestines. Gastro retention helps to provide better availability of new products with new therapeutic possibilities and substantial benefits for patients. The controlled gastric retention of solid dosage forms may be achieved by the mechanisms of mucoadhesion,[2,3] flotation,[4] sedimentation,[5,6] expansion,[7,8] modified shape systems,[9,10] or by the simultaneous administration of pharmacological agents[11,12] that delay gastric emptying. Based on these approaches, classification of floating drug delivery systems (FDDS) has been described in detail. In vivo/in vitro evaluation of FDDS has been discussed by scientists to assess the efficiency and application of such systems. Several recent examples have been reported showing the efficiency of such systems for drugs with bioavailability problems. The aim of the present work is to formulate and evaluate floating tablet of Cilnidipine using natural polymers like xanthan gum and guar gum. According to BCS classification, Cilnidipine coming under class4 category which has low solubility and low permeability.

Gastroretentive delivery is one of the site-specific deliveries for the delivery of drug either at stomach or intestine.

As Cilnidipine has higher absorption site in the upper gastrointestinal tract and poor absorption in colon, suggest it is an ideal candidate for a gastroretentive drug-delivery system that will prolong the gastric residence time of the dosage form, giving prolonged drug release in the upper gastrointestinal tract, where absorption of Cilnidipine iswell confined.

A systemic approach for design and development of gastroretensive drugdelivery system of Cilnidipine using polymers which increases the gastric residence time, decreases the diffusion distance and allow more of the antibiotic to penetrate through the gastric mucus layer and act locally at the infectious site to enhance the bioavailability and therapeutic efficacy of the drug.

Naturally occurring polymers is preferred for controlled formulation becauseof its low cost, naturally available, biocompatible and better patient tolerance as well as public acceptance.

So planned to formulate and evaluate floating tablets of Cilnidipine using natural polymers.

MATERIALS AND METHODS

LIST OF MATERIALS

Table no. 1: Materials and their suppliers.

S.No.	MATERIAL	SUPPLIED BY
1.	Cilnidipine	Fourrts India pvt, Ltd
2.	Xanthan gum	Cadila pharma pvt, Ahmedabad
3.	Guar gum	Zydus pharma pvt, Hosur
4.	Sodium bicarbonate	Medo pharm pvt. Ltd,
5.	Lactose	Orchid pharma pvt, ltd
6.	Magnesium stearate	Bafna pharma pvt, ltd
7.	Hydrochloric acid	Merck specialties pvt, ltd, Mumbai
8.	Methanol	Medo pharm pvt, ltd, Chennai

METHODOLOGY

STANDARD CURVE OF CILINIDIPINE DRUG

The calibration curve is based on the spectrophotometry. The maximum absorption was observed at 276nm. It obeyed Beer's law in the concentration range of 2-10 µg/mL.

Preparation of stock and standard solution

The stock solution was freshly prepared by dissolving 100mg of Cilinidipine in few ml of methanol (5ml) in a 100ml volumetric flask and then madeup the solution up to the mark using 0.1N hydrochloric acid for obtaining the solution of strength 1000 µg/mL (stock I). 10ml of this solution is diluted to 100ml with 0.1N hydrochloric acid to obtain a solution of strength 100 µg/mL (stock II).

Preparation of various concentrations

10 ml stock solution was taken from stock solution-2 and volume made up to 100 ml by using 0.1N hydrochloric acid to get 10 µg/ml concentrations. From this solution with draw 2, 4, 6, 8, 10 ml of solution in to the 10 ml volumetric flask and volume made up to 10 ml by using 0.1N hydrochloric acid to get the concentrations 2, 4, 6, 8, 10 µg/ml.

6.4 Preparation method of Cilinidipine floating tablets

Cilinidipine was mixed with the required quantities of polymers (xanthan gum and guar gum) sodium bicarbonate (12%), and lactose by geometric mixing. The powder blend was then lubricated with magnesium stearate (2%) and mixed for about 3 minutes. Finally, this mixture was compressed on proton mini press tablet punching machine**.**

Formulation composition of gastro-retentive tablets of Cilinidipine

Table 2: Quantity of raw materials Per tablet (In mg)

S.NO	INGREDIENS	F1	F2	F3	F4	F5	F6	F7	F8	F9
1	Cilinidipine	250	250	250	250	250	250	250	250	250
2	Xanthan gum	10	10	-	15	15	-	20	20	-
3	Guar gum	10	-	10	15	-	15	20	-	20
4	Sodium bicarbonate	20	20	20	20	20	20	20	20	20
5	Lactose	25	35	35	15	30	30	5	25	25
6	Magnesium stearate	5	5	5	5	5	5	5	5	5

RESULTS AND DISCUSSION

PREFORMULATION STUDY

Organoleptic properties

Table 2: bservation of organoleptic properties.

TEST	SPECIFICATION	OBSERVATION
Colour	Pale yellow	Pale yellow
Odour	Odour less	Odorless
Taste	Tasteless	Tasteless

Solubility analysis

Cilinidipine samples are examined and it was found to be soluble in water and slightly soluble methanol, soluble in dimethyl formamide. It also dissolves in dilute alkali and in dilute acids.

Melting point of drug

The melting point of Cilinidipine was determined by capillary method, melting point of Cilinidipine was found to be 255°C. Melting point compared with USP standards that showed that drug is pure.

Loss on Drying

Table-3: Observations for loss on drying.

Test	Loss on drying	Observation
Loss on drying	Not more than 0.5%	0.42%

The loss drying of drug was founded as 0.42 which is within the limit.

Drug powder haracterization.

Angle of repose.

Table 4: Angle of Repose.

Material	Angle of repose
Cilinidipine	28.11

The results indicating that the raw material has excellent flow property.

Flow properties

Table 5: Flow properties of pure drug.

Material	Bulk density	Tapped density	Carr's index (%)	Hausner ratio(%)
Cilinidipine	0.23	0.46	11.02	1.134

The results are clearly indicating that Cilinidipine raw material has good flow property.

Drug-polymer compatibility study

- **FTIR Studies**

The FTIR spectra of the pure drug, excipient and physical mixture of drug and excipient were recorded in between 400-4000 wave number (cm^{-1}). No peaks are observed which interfere with the main drug peaks. The following spectrum and table show IR spectrum for drug and polymer and the wave number of characteristic bandsfor the same.

The IR Spectrum preview pictures are as follows.

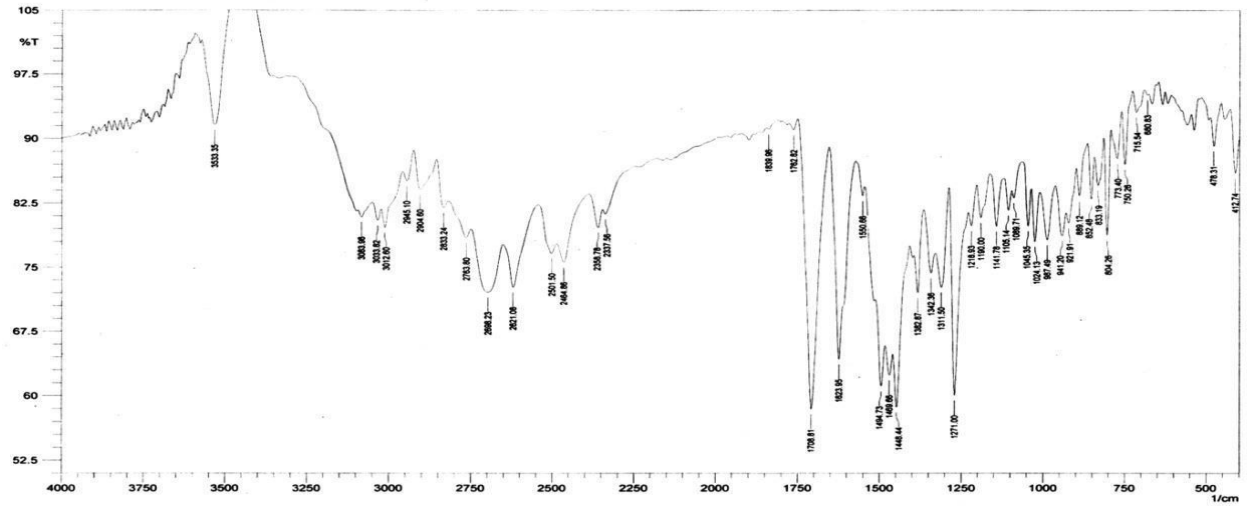


Fig. No: 1: IR Spectrum of Cilinidipine standard.

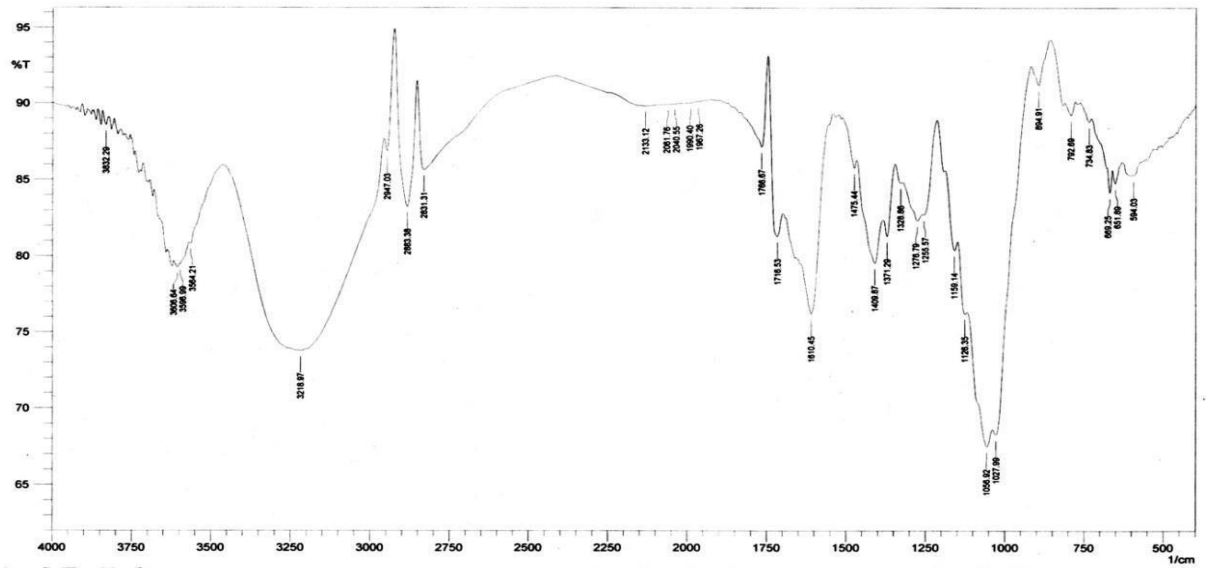


Fig. No: 2: IR Spectrum of xanthan gum.

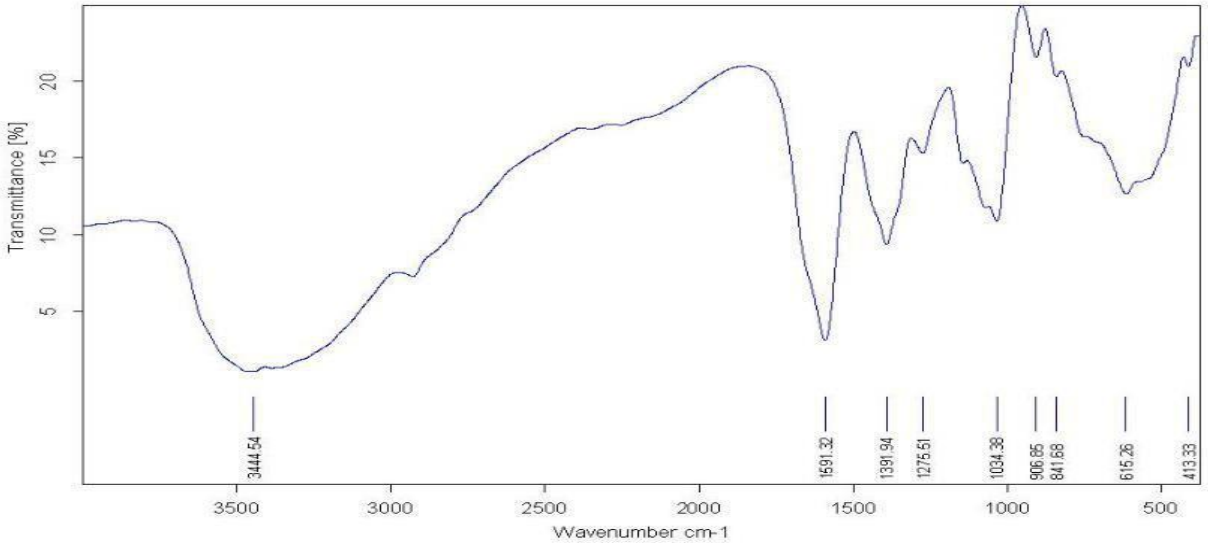


Fig. No: 3: IR Spectrum of guar gum.

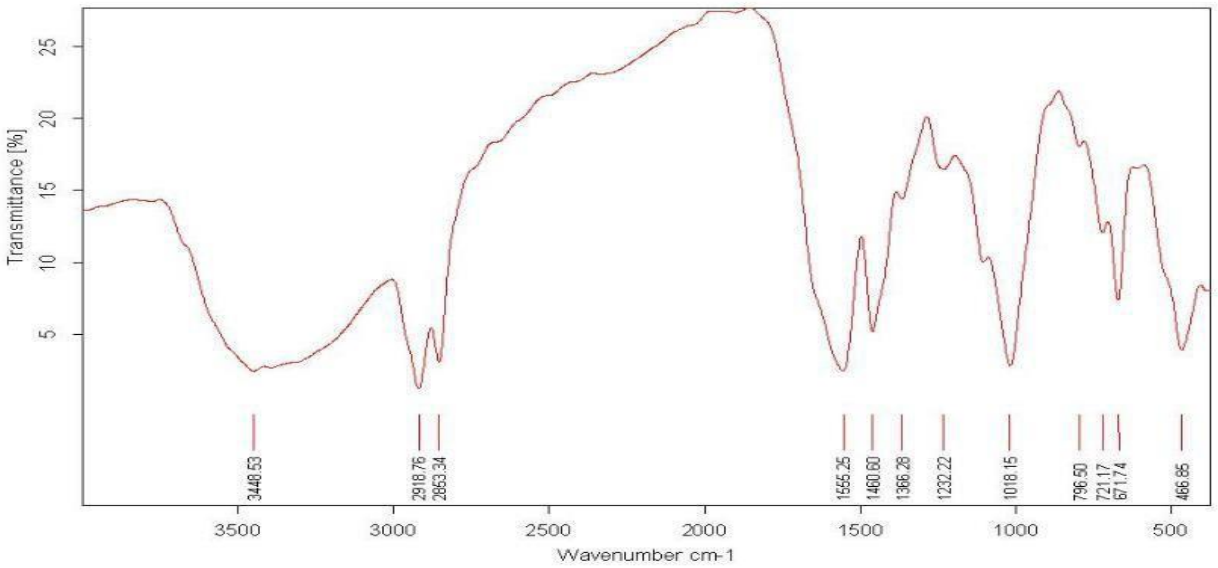


Fig. No: 4: IR Spectrum of magnesium stearate.

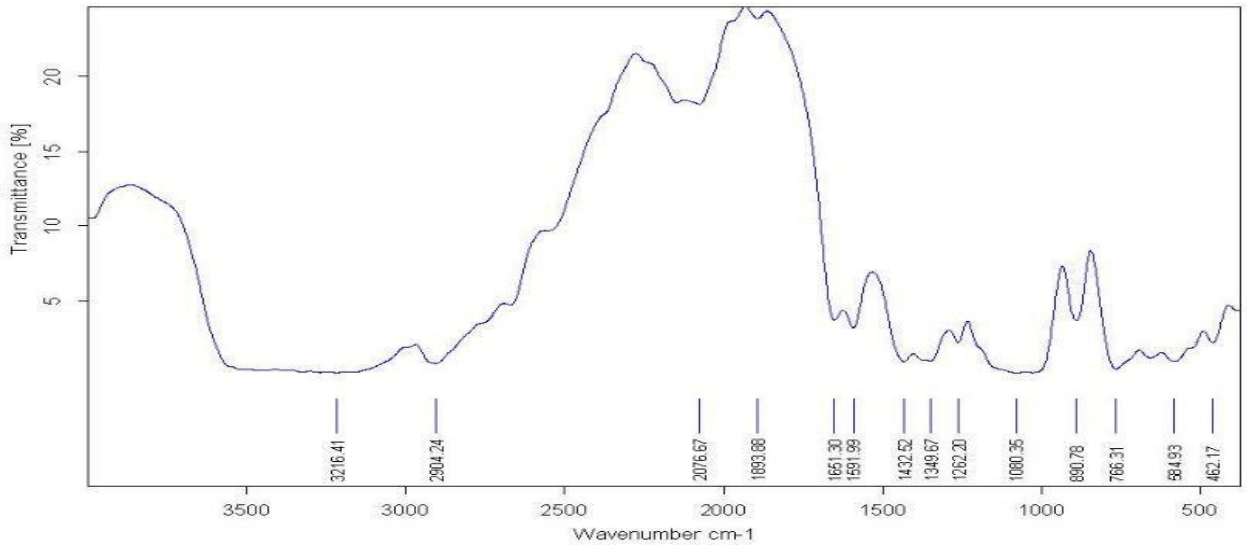


Fig. No: 5: IR Spectrum of lactose.

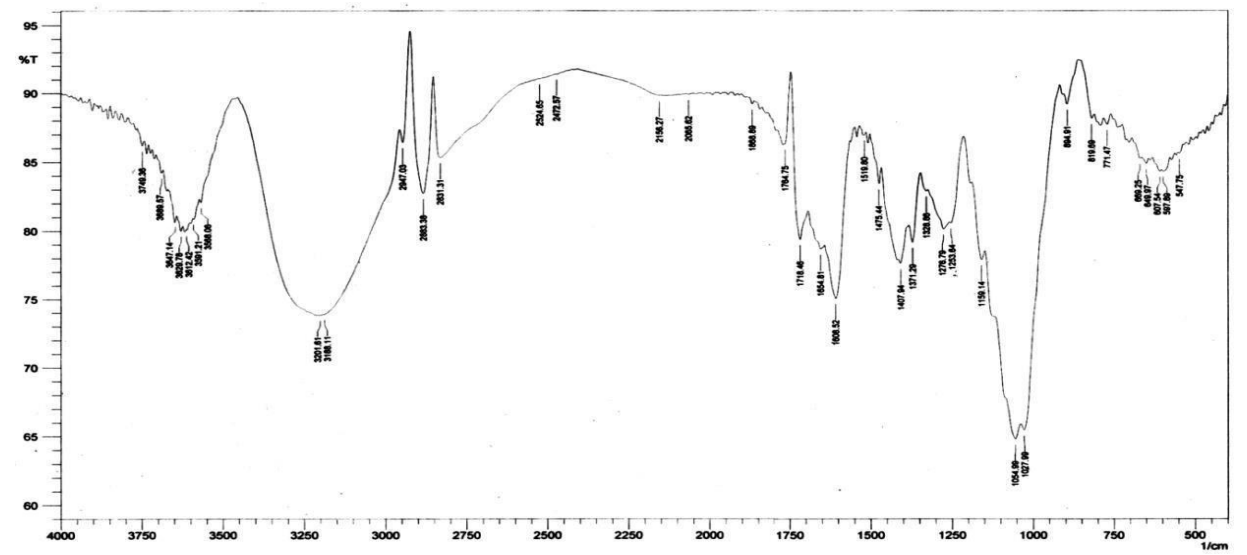


Fig. No: 6: IR Spectrum of Cilinidipine and xanthan gum.

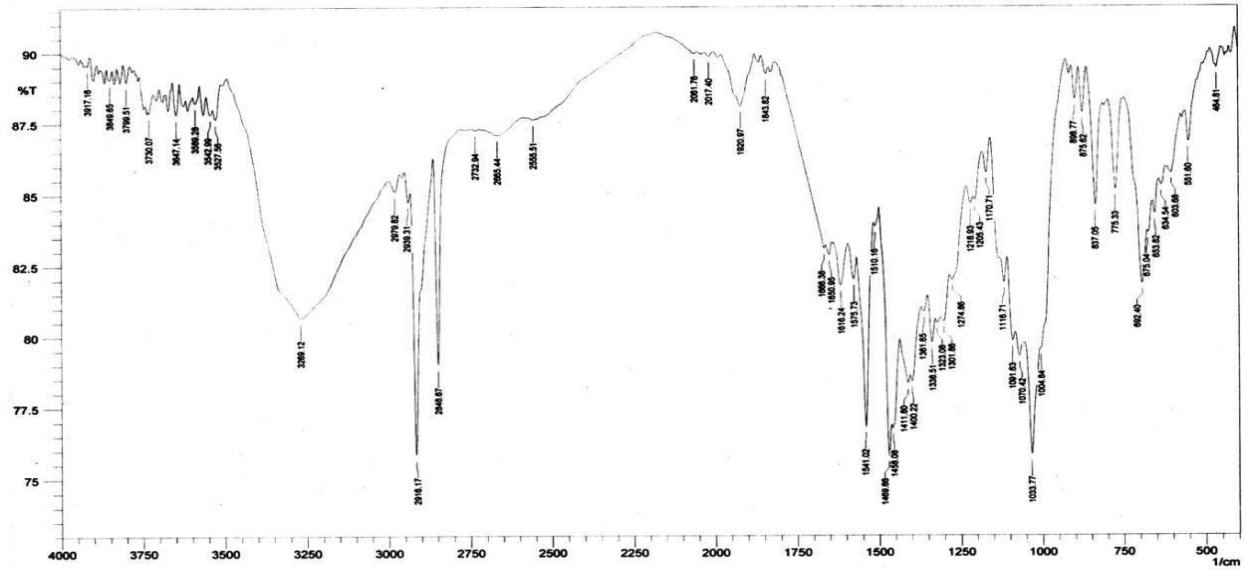


Fig. No: 7: IR Spectrum of polymers and excipients.

Table 6: FT-IR Peaks of various components.

S. No	Peak in pure drug (cm^{-1})	FunctionalGroup	Type of vibration	Peak inPhysical mixture
1.	3533.35	Amine (N-H)	Stretch (medium)	3269.12
2.	1708.81	Ketone(C=O)	Stretch (medium)	1718.46
3.	1623.95	Alkene (C=C)	Stretch (Strong)	1608.52
4.	1271.00	Carbonyl(C-O)	Stretch (Scissoring)	1276.79

Compatibility studies were performed using IR spectrophotometer. The IR spectrum of pure drug and physical mixture of drug and polymer were studied. From the above results functional groups and type of vibrations are noted.In case of FTIR study there was no disappearance or appearance of already existing peaks. Hence drugs were found to be compatibles with excipients.

STANDARD CURVE OF CILINIDIPINE PURE DRUG

Calibration curve of Cilinidipine was determined by plotting absorbance (nm) versus concentration (µg/ml) at 276 nm. The results obtained are as follows.

Table 7: Standard curve of Cilinidipine.

Concentration µg/ml	Absorbance
0	0
2	0.193
4	0.421
6	0.613
8	0.800
10	0.985

The linear regression analysis was done on absorbance data points. A straight line generated to facilitate the calculation of amount of drug, the equation is as follows.

Y = mx + c

Where Y=absorbance, m=slope, x=concentration.

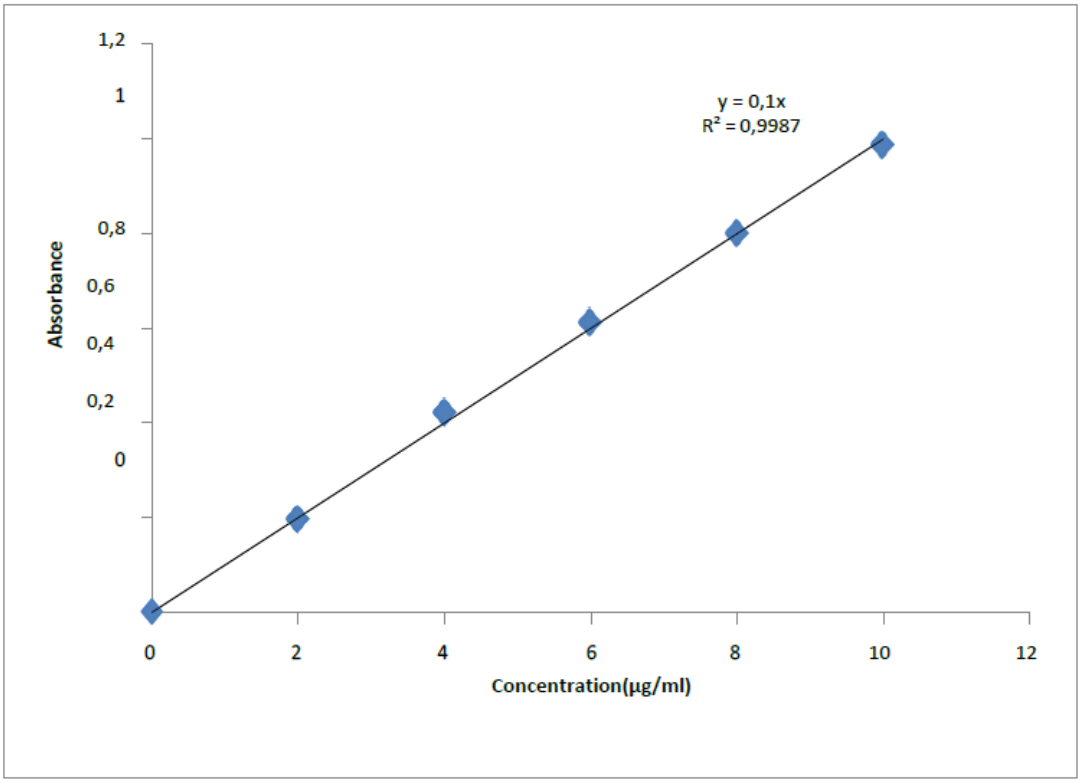


Fig No.8: Standard plot for Cilinidipine in 0.1 N HCL.

EVALUATION OF FORMULATED METHODS

Before formulating floating tablets pre compression parameter were evaluated.

Table 8: Evaluation of powder characteristics.

Formulationcode	Angle ofrepose (degree± SD)	BD (gm/ml±SD)	TD (gm/ml±SD)	Carr'sindex (%± SD)	Hausnerratio (%± SD)
F1	26.11±0.02	0.313±0.02	0.364±0.01	14.54±0.03	1.05±0.03
F2	27.01±0.01	0.324±0.05	0.381±0.02	15.11±0.04	1.06±0.02
F3	26.02±0.01	0.334±0.04	0.376±0.03	13.59±0.02	1.13±0.03
F4	25.04±0.02	0.342±0.02	0.384±0.02	16.42±0.04	1.37±0.05
F5	26.94±0.06	0.294±0.02	0.323±0.04	13.13±0.06	1.12±0.05
F6	25.32±0.06	0.263±0.01	0.334±0.04	15.23±0.03	1.13±0.04
F7	26.13±0.03	0.256±0.05	0.374±0.04	14.46±0.06	1.14±0.02
F8	27.10±0.06	0.305±0.05	0.332±0.03	13.31±0.07	1.14±0.04
F9	26.36±0.04	0.332±0.02	0.336±0.01	16.21±0.05	1.28±0.04

Angle of repose for all formulations were examined. The values were found to be within the range from 25.04±0.02 to 27.10±0.06. This indicates that good flow property of powder blend. The bulk density and tapped density values were found to be within the range from 0.256±0.05 to 0.334±0.04 and 0.323±0.04 to 0.381±0.02 respectively.

The hausners ratio values were found to be within the range from 1.05±0.03 to 1.37±0.05. this indicates that good flow property of powder blend.

Based on the results the physical mixture was found to be suitable for direct compression. So F1 to F9 batches were formulated accordingly to the composition given in table 9 of and kept in for evaluation.

EVALUATION OF FORMULATED TABLETS

Table-9: Evaluation of formulated tablets.

Formulation code	Weight variation (n=20) (mg ± SD)	Hardness (kg/cm^2±SD)	Friability (%)	Drug content (%± SD)	Thickness (%± SD)
F1	319±2.99	4.1±0.34	0.11	96.76±0.19	3.3±0.12
F2	320±1.98	4.0±0.71	0.23	95.14±0.23	3.2±0.20
F3	318±3.5	4.1±0.22	0.12	96.87±0.41	3.3±0.03
F4	320±6.1	4.1±0.32	0.26	97.23±0.22	3.3±0.14
F5	320±1.3	4.0±0.28	0.22	96.48±0.26	3.3±0.02
F6	319±6.59	4.1±0.37	0.14	95.67±0.17	3.2±0.53
F7	318±1.6	4.0±0.09	0.13	94.87±0.32	3.3±0.04
F8	319±3.06	4.0±0.42	0.25	96.28±0.33	3.2±0.16
F9	320±3.9	4.0±0.06	0.13	96.87±0.16	3.2±0.29

The formulated floating tablets were then evaluated for various physical characteristics like thickness, weight variation, hardness, friability and drug content. The weight variation of tablets was uniform in all formulations and ranged from 318±1.6 to 320±3.9.

The % deviation is coming within 5% to 7% range for this accepted % deviation should be 5 % for 320mg tablet. F1-F9 batches come with in limit and passed the test.

The hardness of the prepared tablets was ranged from 4.0±0.06 to 4.1±0.37, friability values were ranged from 0.11 to 0.26 which falls within the limit of standard (0.1 to 0.9%). Drug content of tablets was ranged from 94.87±0.32 to 97.23±0.22, F4 showed maximum drug content. Thickness of tablets was uniform and values are ranged from 1.2±0.20 to 1.3±0.14.

Buoyancy/floating test

On immersion in 0.1 N hydrochloric acid solution P^H (1.2) at 37^0C, the tablets floated, and remained buoyant without disintegration. Table-18 shows the results of buoyancy study and shows buoyancy character of prepared tablet.

The buoyancy lag time for F1-F9 were ranging from 45-90 secs.

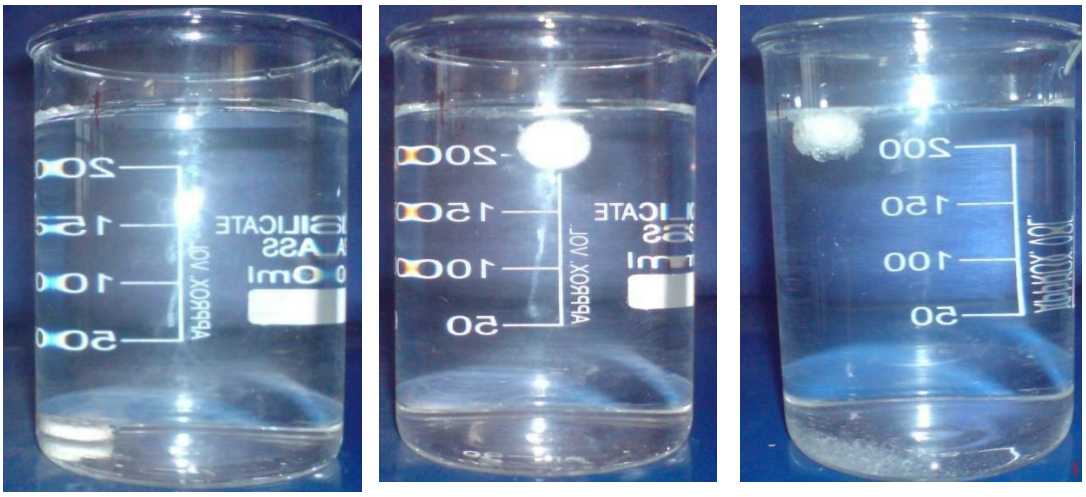
From the results it can be concluded that the batch containing both xanthan gum and guar gum showed good buoyancy lag time (BLT) and total floating time (TFT).

Formulation F4 containing xanthan gum and guar gum showed good BLT of 45 sec, while the formulation containing xanthan gum alone and guar gum alone showed highest BLT and TFT of greater than 8 hrs. This

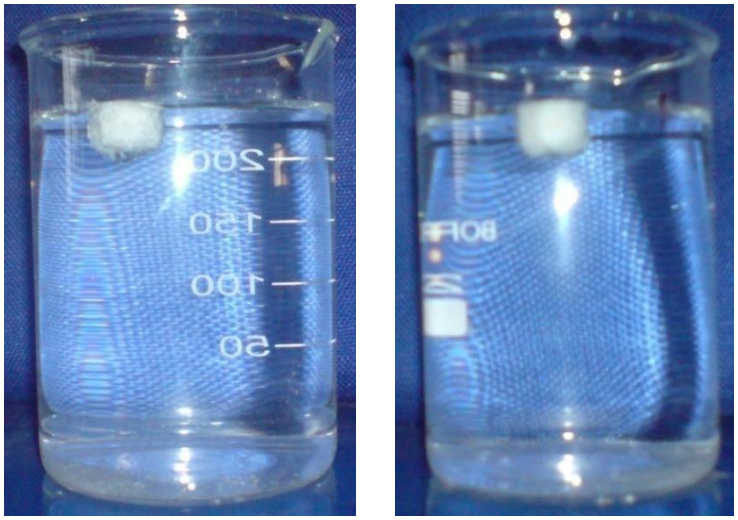
may due to the amount of polymer and gas generating agent, which were kept constant in the present study. The gas generated cannot be entrapped inside the gelatinous layer, and it escapes leading to variation in BLT and TFT.

Table 10: Buoyancy and floating time.

S. No	Batch No	Buoyancy lag time (sec)	Floating duration (HRS)
1	F_1	55	> 8 HRS
2	F_2	60	>8 HRS
3	F_3	50	>8 HRS
4	F_4	45	>8 HRS
5	F_5	70	>8 HRS
6	F_6	90	>8 HRS
7	F_7	60	>8 HRS
8	F_8	50	>8 HRS
9	F_9	55	>8 HRS



0 min **2 min** **4 hr**



6 hr **8 hr**

Fig No: 9: In vitro buoyancy study of Cilinidipine floating.

Swelling Index

The percentage swelling obtained from the water uptake studies of the formulations is shown in Figure 10-12. The formulations with xanthan gum and guar gum showed the swelling and tablet integrity. The change in sodium bicarbonate concentration did not show any effect on swelling of the tablet. Complete swellingwas achieved at the end of 6 hrs, then diffusion and erosion takes place. The formulation containing xanthan gum shows the higher swelling compared to that of the formulations

containing both xanthan gum and guar gum alone. The swelling index of the tablets increases with an increase in the polymer viscosity grades.

Table 11: % Swelling Index of Formulated Floating Tablets.

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9
1hr	19.54	25.15	18.22	20.1	19.99	19.26	13.05	16.12	11.15
2hr	32.22	42.1	33.15	28.98	32.14	30.9	18.55	28.76	17.01
3hr	44.1	56.16	46.1	42.1	45.88	41.1	27.85	43.1	21.85
4hr	61.12	70.11	63.01	52.9	58.22	53.1	39.75	51.1	31.96
6hr	69.02	76.12	71.11	63.89	71.03	60.8	46.1	59.65	43.11

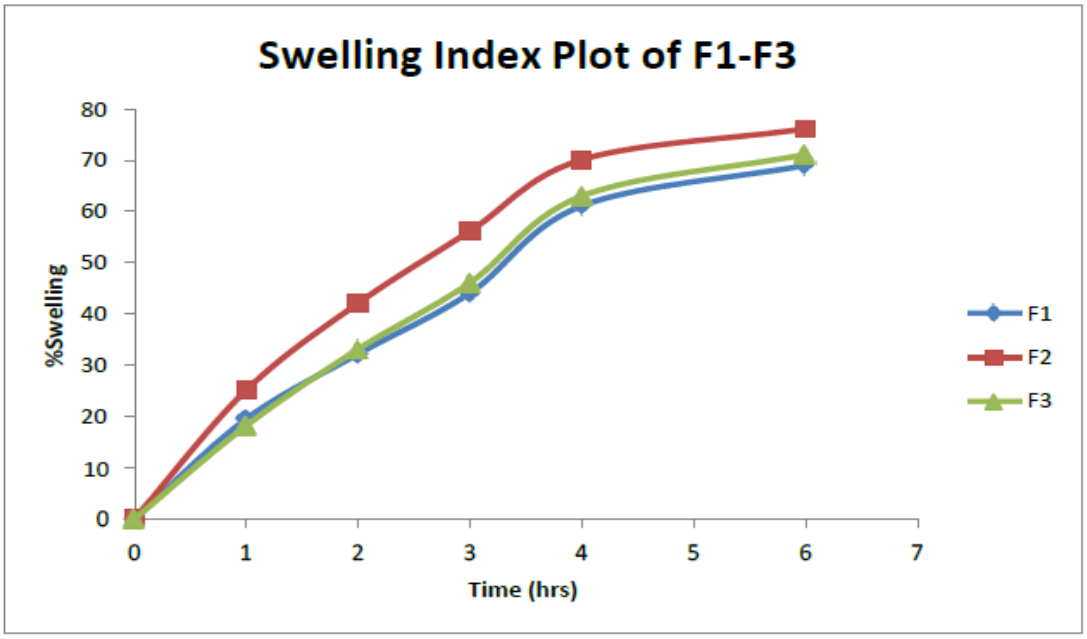


Fig No.10: Swelling Index Plot of F1-F3.

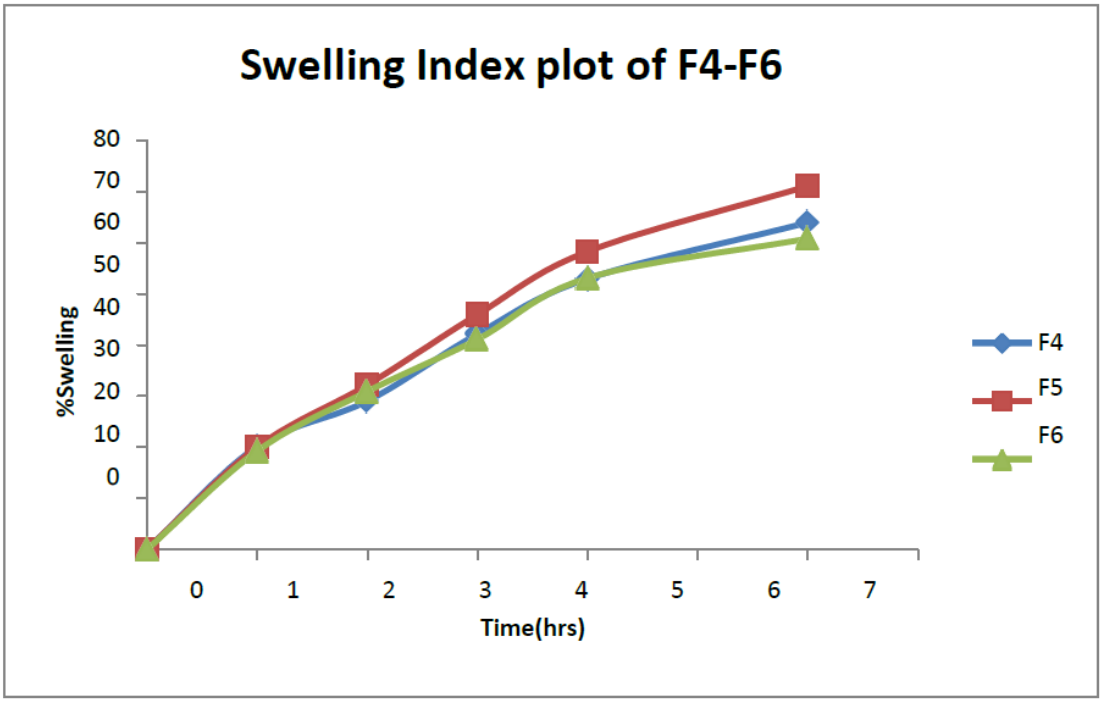


Fig No.11: Swelling Index Plot of F4-F6.

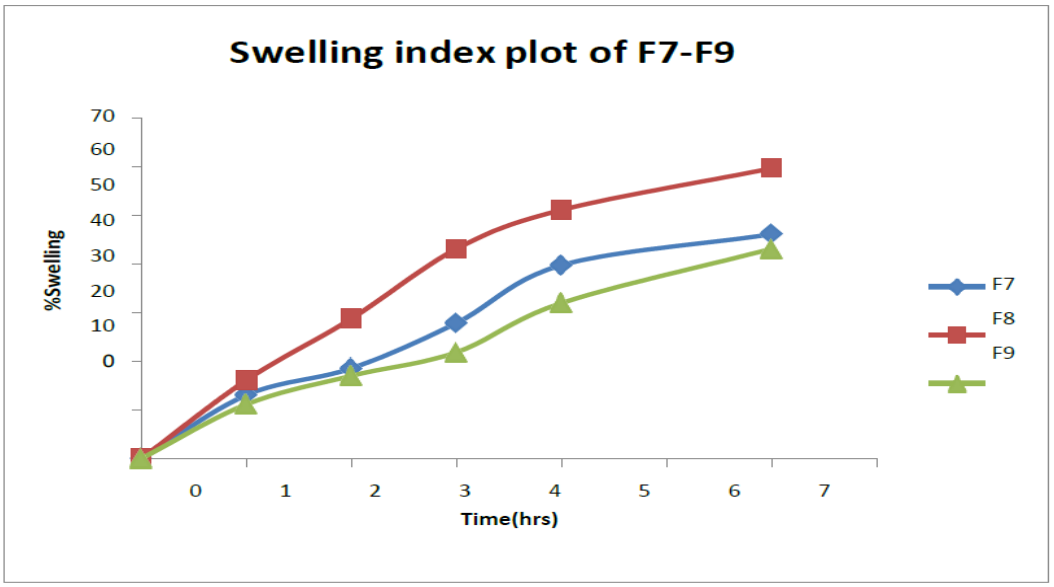


Fig No.12: Swelling Index Plot of F7-F9.

Invitro Drug Release Study of Formulated Floating Controlled Release Formulations

Table 12: Invitro drug release study.

TIME	CUMULATIVE PERCENTAGE DRUG RELEASE (%)								
	Fl	F2	F3	F4	F5	F6	F7	F8	F9
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1	21.01	22.12	26.15	16.08	21.01	8.54	7.15	7.05	9.17
2	31.22	33.46	36.78	27.11	31.04	16.12	13.32	15.45	19.04
3	39.04	42.96	45.80	37.65	43.12	25.77	22.78	22.03	28.26
4	46.05	51.05	52.01	48.76	51.85	34.05	28.04	29.07	34.05
5	53.04	67.09	63.90	56.04	75.75	46.03	34.08	37.12	45.60
6	69.09	78.12	78.08	63.06	81.04	50.46	42.21	42.15	51.75
7	81.98	99.11	92.06	75.05	96.03	55.62	47.67	56.08	60.05
8	98.32	-	99.34	83.56	99.08	61.26	52.06	66.09	67.07
10	-	-	-	90.22	-	71.01	66.45	81.84	72.05
12	-	-	-	99.80	-	89.15	78.80	93.71	83.04

Average of n value n=3.

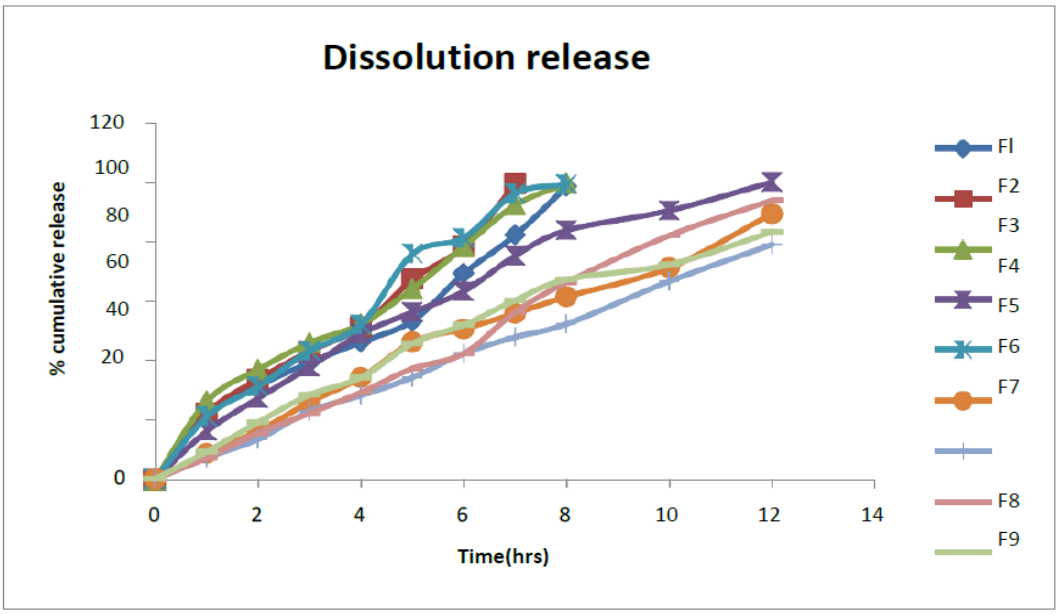


Fig No.13: Invitro drug release study.

The formulated floating controlled release tablets were then subjected to *invitro* dissolution test for evaluating drug release from the formulation. The *invitro* dissolution test was carried out in 900 ml of 0.1N hydrochloric acid in USP-II paddle type apparatus at 50 rpm and 37±0.5°C.

The results of dissolution study were depending on polymer concentration. Formulation containing xanthan gum alone released fast compared to that guar gum alone due to the less binding nature and controlled release property than that of guar gum. Formulation F4 containing xanthan gum (15 mg) and guar gum (15 mg) had given drug release 99.80% in 12 hrs. Then the formulations containing xanthan gum and guar gum were given better release profiles when compared with formulations containing xanthan gum alone and guar gum alone.

KINETIC STUDIES OF FLOATING TABLETS OF CILINIDIPINE

Table-13: kinetic study of optimized formulation.

Time (hrs)	Log Time	√Time	cumulative % drugrelease	Log cumulative % drug release	cumulative % drug remained	Log cumulative % drug remained
0	0	0	0	0	100	2.000
1	0	1.000	16.08	1.206	83.92	1.923
2	0.312	1.454	27.11	1.433	72.89	1.862
3	0.624	1.753	37.65	1.575	62.35	1.794
4	0.715	2.003	48.76	1.688	51.24	1.709
5	0.798	2.274	56.04	1.748	43.96	1.643
6	0.945	2.455	63.06	1.799	36.94	1.567
7	1.090	2.654	75.05	1.875	24.95	1.397
8	1.175	2.924	83.56	1.921	16.44	1.215
10	1.345	3.262	90.22	1.955	9.78	0.990
12	1.398	3.564	99.80	1.999	0.20	-0.698

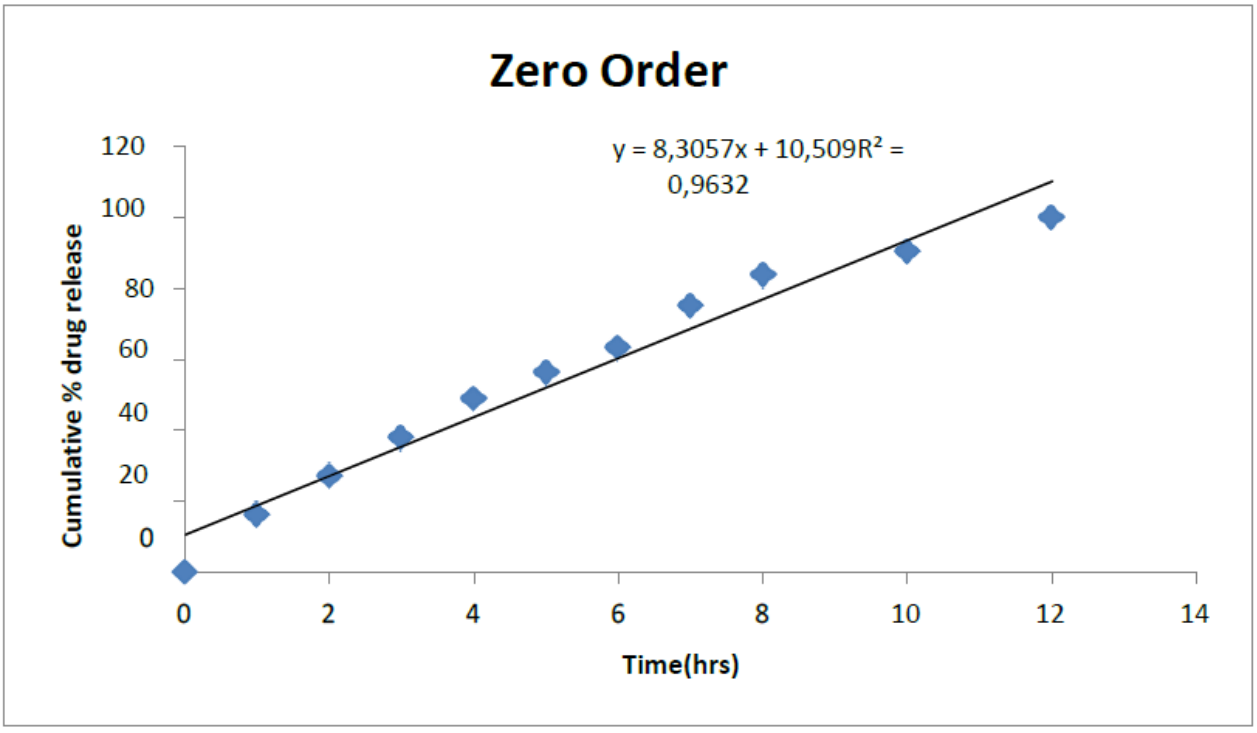


Fig No. 14: Zero order plot.

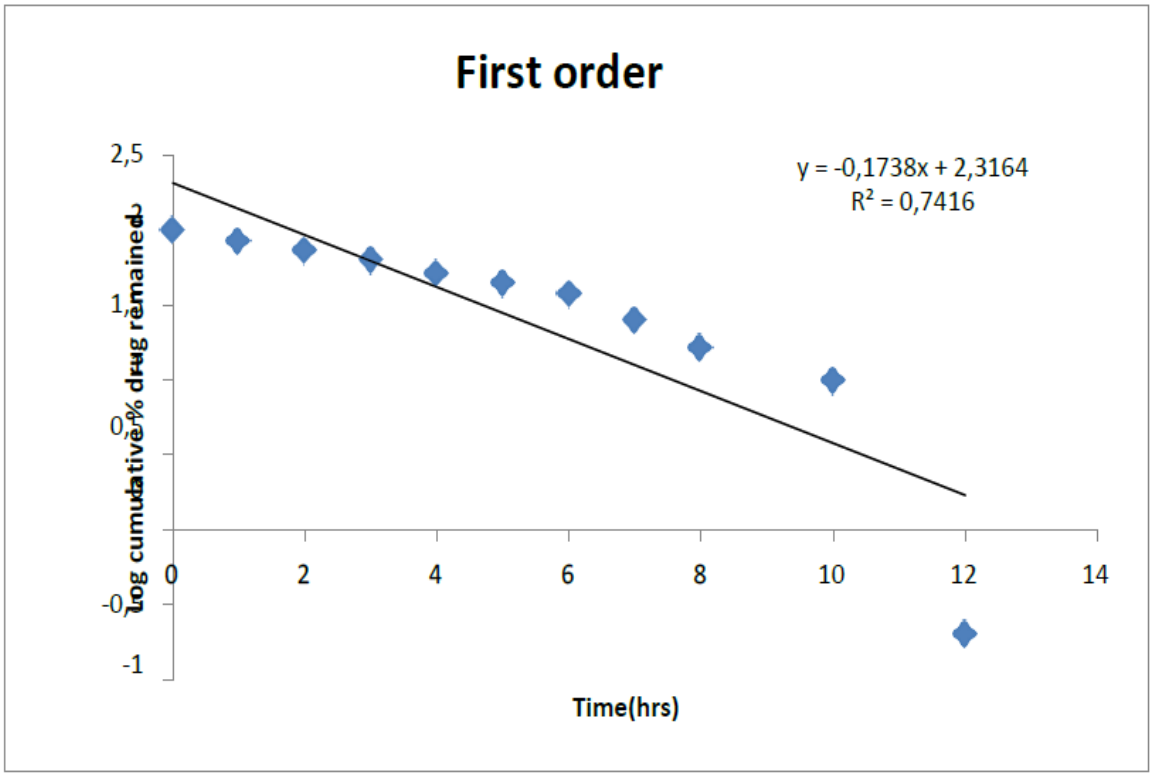


Fig No. 15: First order plot.

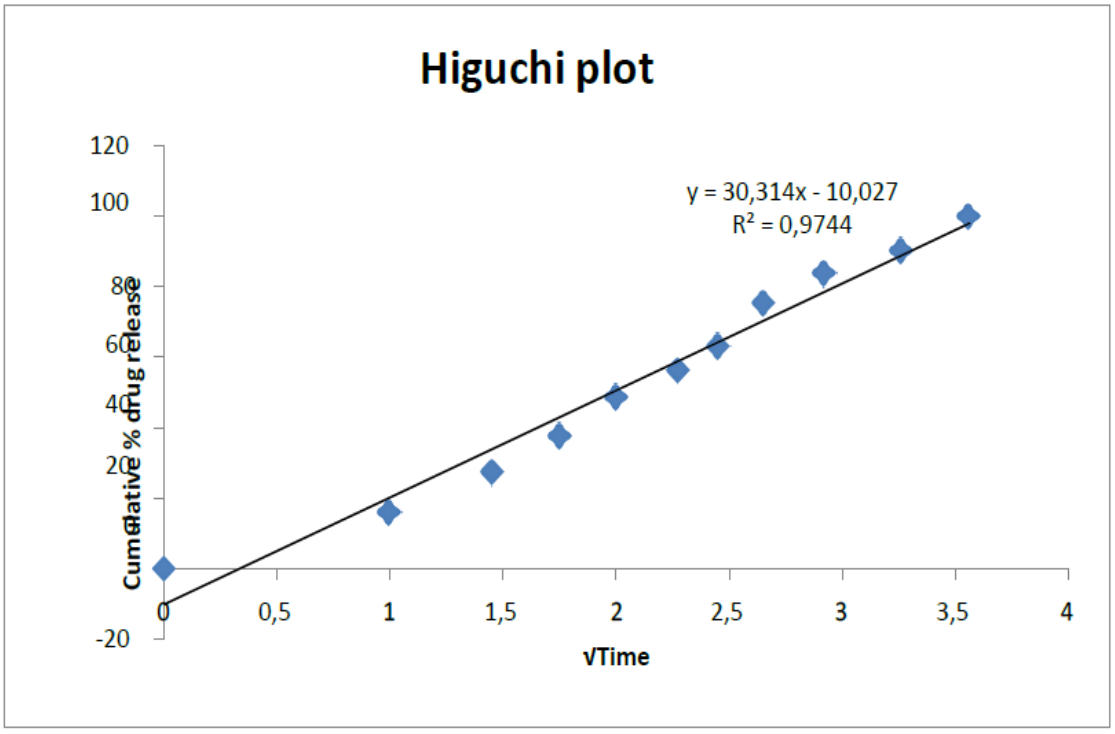


Fig No. 16: Higuchi plot.

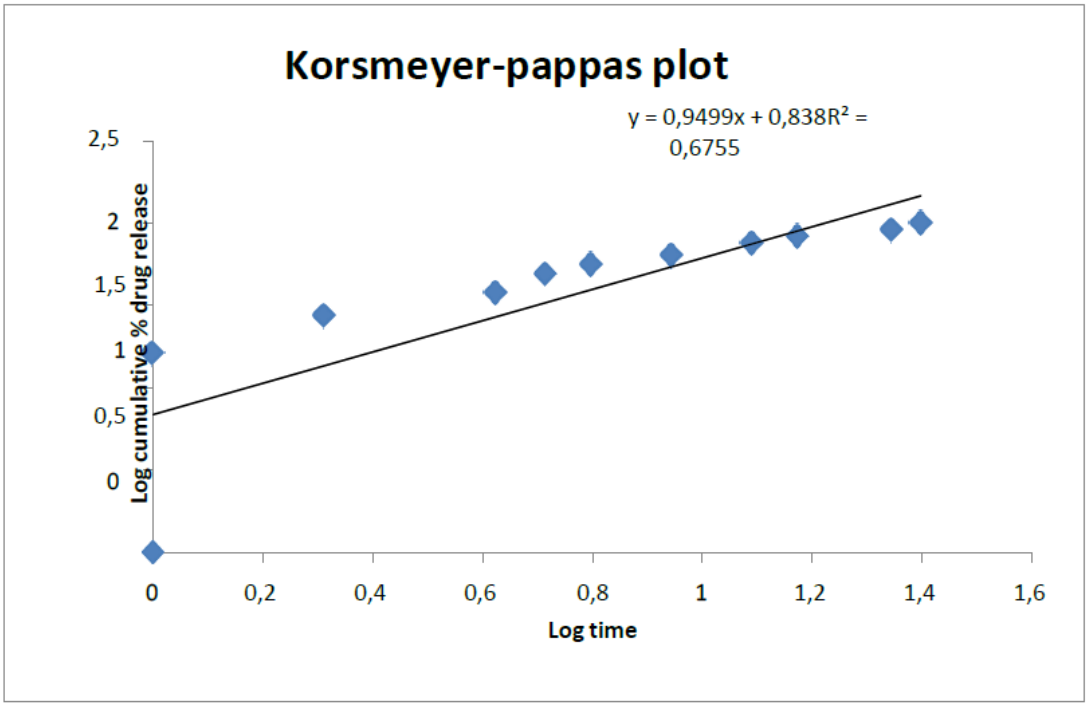


Fig No. 17: Korsmeyer peppas plot.

KINETICS OF DRUG RELEASE

Table-14.

Formulation	Regression coefficient ofzero order	Regression coefficient offirst order	Order of release
F4	0.963	0.741	Zero order release

Table-15.

Formulation	Higuchi Model	Korsmeyer peppas model
	R^2	R^2
F4	0.974	0.675

In order to determine the mechanism of drug release form the formulations, the *Invitro* dissolution data was fitted to zero order, first order, higuchi plot and korsmeyer-peppas plot was drawn and interpretation of release exponent value (n)was calculated and results are shown in figs 14-17. The results of R^2 for zero and first order were obtained as 0.963, 0.741. Based on that we will confirm the optimized formulation followed zero order release.

The drug release was diffusion controlled as the plot of optimized formulation F4 was found 0.974 as regression coefficient in higuchi plot. From korsmeyer peppas plot the release exponent value n was found as 0.675 and it was confirmed as the release of drug from the formulation was founded as anomalous non-fiction transport of diffusion.

STABILITY STUDIES

The optimized formulation was subjected to stability studies at 40^{o}C ± 2^{o}C /75% RH ± 5% for 3 months.

The product was evaluated for following parameters:

- Weight variation
- Hardness
- Friability
- Drug content
- Dissolution analysis

1) Storage condition at 40°C±2°C/75%RH±5%.

Table-16.

TEST	0 days	30 days	60 days	90 days
Weight variation	99±0.87	99±0.55	98±0.84	99±0.76
Hardness	4.5	4.4	4.4	4.3
Friability	0.68	0.69	0.69	0.70
Drug content	99.83±0.04	99.59±0.07	99.39±0.07	99.28±0.06

Dissolution data of percent cumulative drug release for formulation F4.

Table-17: Dissolution data of stability formulation F4.

Time (hrs)	0 days	30 days	60 days	90 days
0	**0**	0	0	0
1	16.15	16.10	15.57	15.65
2	26.75	25.37	25.12	24.92
3	37.80	36.66	36.70	36.48
4	49.12	48.48	46.54	43.82
5	56.15	54.76	52.62	51.55
6	62.65	62.32	60.85	60.12
7	75.16	74.35	73.45	72.58
8	83.60	82.76	82.32	82.02
10	91.15	91.72	91.32	91.54
12	99.75	99.60	99.44	99.34

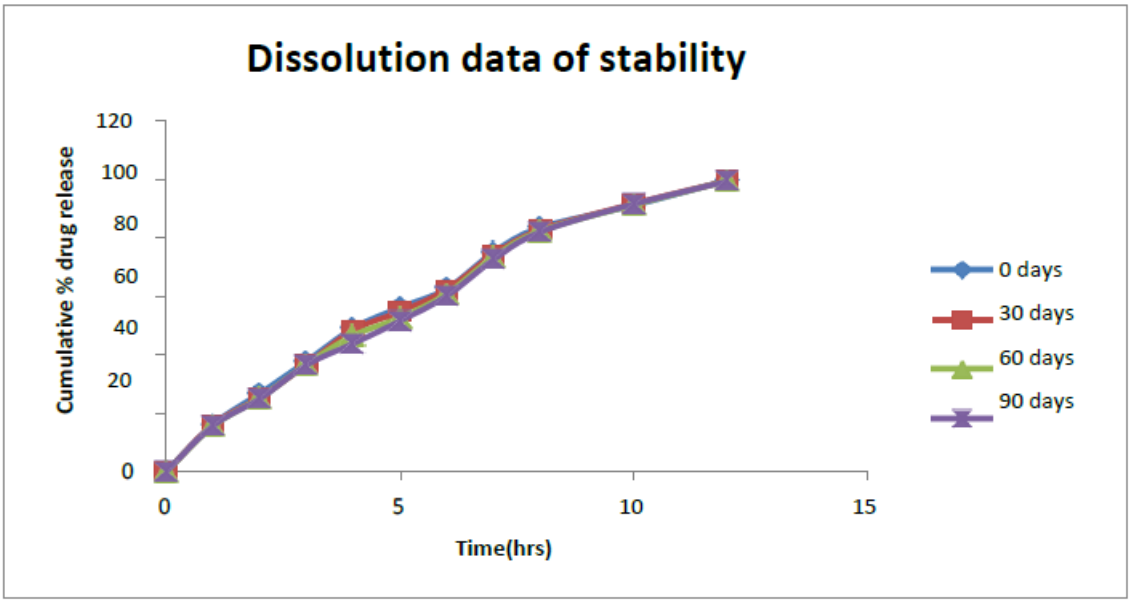


Fig. No. 18: Dissolution data of stability for formulation F4.

The stability studies for optimized formulation F4 were carried out based accelerated stability conditions & study of various parameters carried out at 0, 30, 60, 90 days of intervals and the results found satisfactorily and that reveals that the optimized formulation was stable under accelerated condition.

SUMMARY AND CONCLUSION

The main objective of the present study was to develop floating formulation containing 250 mg of Cilinidipine for twice therapy using natural polymers like xanthan gum and guar gum. GRDDS improved the bioavailability and therapeutic efficiency of drug.

In the pre-formulation, FTIR study was carried out for pure drug (Cilinidipine), Cilinidipine and excipients. It has not shown any interaction. Hence drugs were found to be compatible with excipients.

The formulations were prepared by direct compression method. The angle of repose values for formulations ranges from 25.04±0.02 to27.10 ±0.06. Bulk and tapped densities were used for the measurement of compressibility index. The bulk and tapped values for formulations range from 0.25±0.05 to 0.33±0.04 and 0.32±0.04 to 0.38±0.02 respectively the car's index and harusner's ratio values for formulations range from 1.05±0.03 to 1.37±0.05 respectively. Thus, all formulations exhibited goodflow characteristics.

The prepared floating tablets were evaluated for various parameters like thickness, weight variation, hardness, friability and drug content uniformity. The thickness of tablets in all formulations were ranged from 3.2±0.16 to 3.3±0.14. The weight variation of tablets in all formulations were ranged from 318±1.6 to 320±6.1. The hardness and friability of all the formulations F1-F9 was found to be 4.0±0.6 to 4.1±0.4 and 0.11 to 0.26 respectively. Drug content of all the formulations were ranging from 95.14±0.23 to 97.23±0.22. The buoyancy lag time of all the formulations were ranging from 45sec to 90sec.

Compared to all formulations F4 showed the best

buoyancy lag time, the buoyancy lag time for F4 was found to be 45sec. Total floating time of all formulations was found to be >8 hrs. The formulation containing xanthan gum shows the higher swelling compared to that of the formulations containing both xanthan and guar gum alone.

The prepared tablets were then subjected to dissolution test for evaluating the *invitro* drug release. The dissolution studies were carried out in 0.1N hydrochloric acid in USP-32 apparatus at 37±0.5°C.

The results of the dissolution studies indicated that the polymer concentration was having a substantial effect on the drug release from the tablets. Formulation F4 gave better controlled drug release and floating properties in comparisons to the other formulations. This formulation took 45sec to become buoyant.

The kinetic study was carried out for F4 formulation which showed that the drug release followed zero order kinetics followed by non-fickian diffusion.

The stability studies were carried out for F4 formulation at 45°C 175% RH for 3months. Data revealed that there was no considerable difference.

From the above study, concluded that F4 was the optimized formulation which has shown better buoyancy time 45sec and drug release 99.80% in 8hrs. However, further *invivo* studies can be carried out to support the results.

The overall results explained that the tablets prepared by combination of xanthan gum and guar gum could be more effective on floating tablets and has shown more sustained effect than floating tablets containing natural polymer alone.

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