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Formulation and Evaluation of Floating Tablet of Prazosin HCL

Adhav Rameshwar S., Prof Patil. N., Dr. Megha T. Salve

Shivajirao Pawar College Of Pharmacy, Pachegaon Tal. Newasa Dist. Ahilyanagar
Email- rameshwaradhav7776@gmail.com

ABSTRACT

In this present study, floating of Prazosin HCL were formulated to improve the gastric retention time and overall bioavailability. Different mucoadhesive polymers like HPMC K200 M, Na CMC, Carbopol 974P, Karaya gum, Chitosan and Xanthan gum were selected to formulate the tablets. Various formulations were prepared by using these polymers in different concentration. The pre-compression blend of Prazosin HCL mucoadhesive tablets were characterized with respect to angle of repose, bulk density, tapped density, carr's index and hausner's ratio and all the results indicated that the blend was having good flow property and hence better compression properties. The swelling studies were peFormed for the formulations and the results depicted that all the formulations have a good swelling index. The drug release studies depicted that the formulations release the drug in first order. So based on the results, formulation F13 was found to be an optimized formulation.

Keywords: Mucoadhesive tablets, Prazosin HCL, Bioadhesive polymers.

Introduction

Oral drug delivery system having major advantages over others because it delivers the drug in an appropriate attitude to the systemic circulation which leads to patient compliance. Moreover, it has been observed that preponderance numbers of drugs are chosen in the oral route than others, almost 90% of drugs are ideal by this route. Under the umbrella of the oral drug delivery system, there are voluminous divisions are available to carry the drug into the systemic circulation. Bioavailability of drugs in the systemic circulation is very fewer in the case of conventional oral drug delivery due to its reduced residence or slighter introduction to the site of absorption window which leads to less bioavailability. In comparison to the conventional oral drug delivery system with oral controlled dosage form systems denote more advantages and overcome problems associated with it. Control drug delivery systems proved to be more capable and advantageous than the conventional drug delivery system because of its perpetual or adaptable release rate.

Merits of GRDDS

- Upsurges Bioavailability of drug elements.
- Due to a definite area of drug delivery cuts objectionable properties.
- It helps to lessen the variation of drug absorptions and adverse properties.
- It upsurges the residence period in the abdominal area and lessens the dosing frequency.
- It is more beneficial to the elements that have a shorter half-life.
- It is also known as a primarily site-specific delivery system, due to increase residence time in the abdominal area.
- The due upsurge in residence time in the stomach helps drug elements who have a lesser amount of solubility at a basic pH environment.
- It is more valuable over the conventional system since it overcomes the problem allied with.

Demerits of GRDDS

- The release pattern may vary.
- Various factors may alter the release rate of drugs i.e. diet and the rate of passage through gut.
- Release patterns may vary from one formulation to another due to changes in additives.
- Due to loss of reliability in dosage form the availability of loading dose may cause toxicity.

- For such kind of dosage form, it cannot be modified or redesigned.
- Acid labile drugs cannot be given by this route.

Different GRDDS dosage form

- Floating microspheres contain a different category of the drug-like - HMG-CoA reductase inhibitors, Antihypertensive, Antidiabetic, and Antibiotic.
- Floating granule contains a different category of a drug like - Analgesic, ibuprofen, HMG- CoA reductase inhibitors, Antihistamine, and Antihypertensive.
- Films contain different drug category like- Antihistamine
- Floating capsules contain a different category of a drug like- COX-2 inhibitor, Antidiabetic, Antidepressant, Diuretic, and Anti-inflammatory.
- Floating tablets contain a different category of a drug like Antibiotic, Antidiabetic, Antihypertensive, HMG-CoA reductase inhibitors.

Application Enhanced bioavailability

'Bioavailability' enhancement is possible for the drugs that are having a narrow absorption window in the stomach. Due to escalation in the residence time of dosage form, the drug can expose to the gastric environment for more periods hence the absorption of the drug also improved. It has been proved by comparing with conventional dosage form with drug riboflavin

a. Sustained drug delivery

There are many problems associated with controlled release dosage form which can be minimized by a floating drug delivery system. The major problem associated with a controlled release dosage form is the residence time of formulation in the stomach. By the different approaches of GRDDS this problem can be resolved like- low-density formulation, the larger size of formulation, gas generating, and swelling of formulation techniques

b. Site-specific drug delivery

These frameworks are especially profitable for drugs which precisely engrossed from the 'stomach' or the 'proximal portion' of the digestive system. The primary part of medicaments is absorbed in the abdominal area followed by in duodenum. It has been accounted for dosage forms designed with delayed gastric living arrangement time was shaped and the bioavailability was expanded for furosemide and observed that AUC changed dramatically

Absorption

Medications that have deprived 'bioavailability' in light of site-explicit ingestion from the superior segment of the gastrointestinal plot are expected contender for GRDDS to achieve better absorption by increasing their retention at the spot of absorption. 'A significant increase in the Bioavailability of floating dosage forms (42.9%) could be achieved as compared with commercially available LASIX tablets (33.4%) and enteric-coated LASIX-long product (29.5%)'

Mechanism of floating systems

Although the framework is floating on the gastric substance the medication is delivered gradually at the ideal proportion from it. The framework will be exhausted from the stomach after discharging the medicaments from the dosage form. Along with the gastric content, some additional attainments are required for buoyancy like-Force (gravity, acceleration, and vertical) and volume of fluid. A negligible degree of floating force (F) is additionally needed to retain the dose structure remain float on the supper. To understand the theory behind this it is necessary to measure the vertical force required to float the object. Greater the F value better the floating time

Table: List of Chemicals

Name of the Chemical
Prazosin HCL
Hydroxy propyl methyl cellulose
Sodium Carboxy Methyl Cellulose
Carbopol 974P
Karaya Gum
Chitosan
Xanthan Gum
Sodium Bicarbonate
Magnesium Stearate
Talc
Lactose

Table: List of Equipment

Name of the Equipment
UV-Visible spectrophotometer
Bulk Density Apparatus
Rotary Punching Machine(Lab Press, India).
Weight Balance
Digital Vernier caliper
Monsanto hardness tester
Roche Friabilator
USP type II dissolution test apparatus

Preparation Calibration Curve of Prazosin HCL

For the calibration curve stock solution-I was prepared by dissolving 100mg Prazosin HCL and 100ml of methanol. 10ml of the above arrangement was taken and made up to 100 ml by utilizing 0.1 N HCl (100µg/ml) called as stock solution-II. In the same way, again 10ml solution was withdrawn from stick solution-II and diluted up to 100ml with 0.1N HCl ((10µg/ml) and named as stock solution-III. Followed by the stock solution III was mixed with 0.1N HCl to maintain the concentration levels as 10, 20, 30, 40, and 50µg/ml of Prazosin HCL /ml of solution. The obtained series were scanned at 248 nm by utilizing a 'UV- Spectrophotometer' with 0.1N HCl as blank. The obtained absorbance was placed in a graph by taking Concentration on X-Axis and Absorbance on Y-Axis to determine the square of the correlation coefficient (R^2).

Pre-formulation Studies: Pre-formulation studies express about the physicochemical properties of excipients. Excipients having a key role in formulation development, which guides us to select appropriate dosage form and also support to create an outline for the manufacturing.

Solubility Studies

The solubility of Prazosin HCL, was figure out in 0.1 N HCl solution. A supersaturation was prepared by mixing medicament and 10ml of solvent in a 20ml vial and sealed it. Sealed vials were placed on the rotary shaker for continuous agitation for a period of 24hrs. at room temperature. As the time over for mixing, the filtrate were passed through 0.2 µm 'Whatmann's filter paper' followed by scanned utilizing 'UV spectrophotometer' at 248 nm.

Preparation of Floating Mucoadhesive Tablets

The direct compression method is opted to formulate Floating mucoadhesive tablets containing Prazosin HCL trials were developed by altering the proportion of HPMC K200M, Na CMC, Carbopol 974P, Karaya gum, Chitosan, and Xanthan gum. Sodium bicarbonate is helped to float the tablets. Talc and magnesium stearate and lactose are used for enhancing lubrication property, gliding property, and diluent subsequently. The drug, polymers, sodium bicarbonate, and lactose were mixed properly for 15 min until formed a homogeneous mixture. Followed by talc and Magnesium Stearate are added as lubricating agents. The above powder mixture was mixed homogeneously by using a polyethylene bag. Finally, the tablets were prepared by a 6-millimeter width to die in a 9- station pharmaceutical tablet press (Lab Press, India).

Table: The composition of Floating tablets of Prazosin HCL

Ingredients	**F1**	**F2**	**F3**	**F4**	**F5**
Prazosin HCL	4	4	4	4	4
HPMC K200 M	4	8	12	-	-
Na CMC	-	-	-	4	8
Carbopol 974P	-	-	-	-	-
Karaya gum	-	-	-	-	-

Chitosan	-	-	-	-	-
Xanthan gum	-	-	-	-	-
NaHCO3	10	10	10	10	10
Magnesium stearate	4	4	4	4	4
Talc	3	3	3	3	3
Lactose	75	71	67	75	71
Total Weight	100	100	100	100	100

Note: All quantity are mentioned in mg

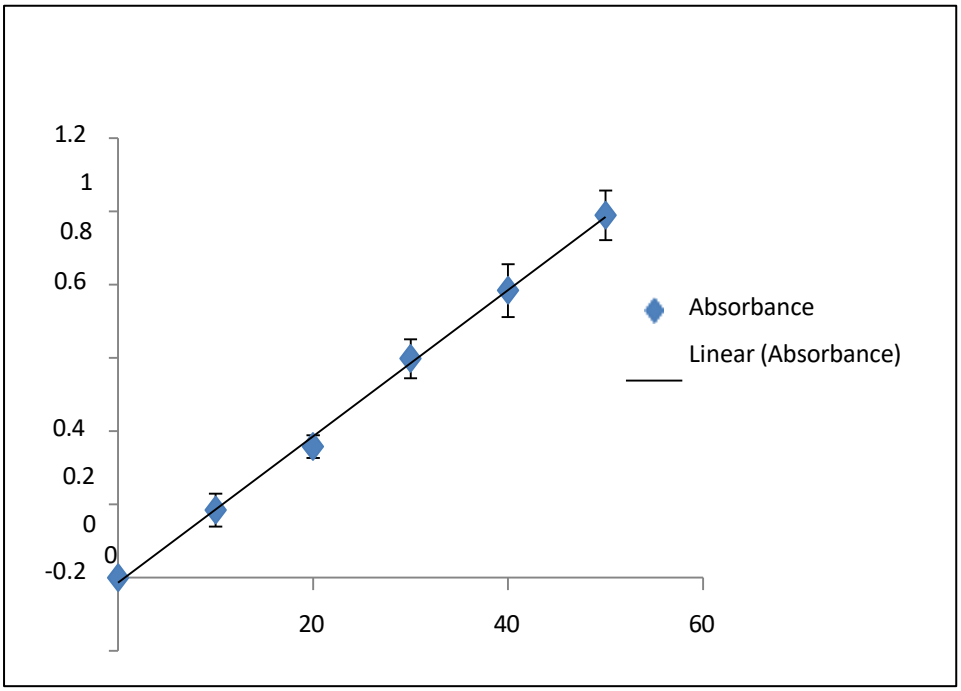
Result and Discussion

Determination of Absorption Maxima: The 'Standard curve' depends on the 'Spectrophotometry'.The maximum absorption was observed at '248 nm'

Table: Calibration curve data for Prazosin HCL

S. No	**Concentration (µg/mL)**	**Absorbance**
1	.0	0±0
2	10	0.185±0.045
3	20	0.358±0.031
4	30	0.598±0.053
5	40	0.784±0.072
6	50	0.989±0.068

Figure: Prazosin HCL in 0.1N HCl



Pre-formulation Studies

- Solubility Studies

Table: Solubility studies Prazosin HCL

S. No	Medium	Amount present (µg/mL)
1	Water	30.67
2	Methanol	100.98
3	0.1 N HCl	48.82

- **Characterization of Pre-Compression Blend**

Table: Results for Derived and Flow properties of Prazosin HCL

Formulation Code	Derived properties		Flow properties		
	Bulk density (mean±SD)	Tapped density (mean±SD)	Angle of repose (mean±SD)	Carr's index (mean±SD)	Hausner's ratio (mean±SD)
F1	0.416±0.009	0.476± 0.008	26.7 ±0.47	12.50± 0.35	1.14± 0.34
F2	0.384± 0.007	0.434± 0.006	26.0 ±0.34	11.53± 0.25	1.13± 0.28
F3	0.555± 0.011	0.714± 0.013	26.6 ±0.22	22.22± 0.15	1.28± 0.36
F4	0.384± 0.004	0.441± 0.006	25.98±0.40	13.46± 0.19	1.15± 0.27
F5	0.266± 0.013	0.312± 0.017	26.32±0.87	14.66± 0.27	1.16± 0.39
Note: Each worth speaks to the mean ± SD (n=3)					

Evaluation of Post Compression Parameters

Table: Evaluation of Floating Mucoadhesive Tablets of Prazosin HCL

Formulation Code	Thickness (mm) (mean±SD)	Average Weight (mg) (mean±SD)	Hardness (Kg/cm^2) (mean±SD)	Friability (%) (mean±SD)	Content uniformity (%) (mean±SD)	Total Floating time (hrs) (mean±SD)	Floating Lag time (s) (mean±SD)
F1	4.59±0.09	98.25±0.28	5.2±0.15	0.35±0.04	95.36±0.27	13±0.59	35.3±0.37
F2	4.91±0.08	99.35±0.24	5.6±0.13	0.29±0.02	99.25±0.24	15.5±0.30	43.0±0.34
F3	4.87±0.04	95.61±0.19	5.9±0.19	0.51±0.06	98.14±0.21	18±0.97	48.1±0.36
F4	4.39±0.06	99.39±0.24	5.4±0.09	0.48±0.02	100.2±0.19	12.5±0.83	39.2±0.31
F5	4.99±0.10	99.48±0.17	5.8±0.13	0.63±0.04	97.45±0.24	14±0.59	32.9±0.30
Note: Each worth speaks to the mean ± SD (n=3)							

***In-vitro* Release Studies** *'In-vitro* drug release studies' were carried out in 0.1N HCl and the test reported that the release of Prazosin HCL.

Table *In-vitro* dissolution data for formulations

Time(hr)	% Cumulative drug release		
	F1	F2	F3
0	0	0	0
0.5	23.06	26.24	28.82
1	28.25	30.16	32.36
2	34.98	36.16	39.68
3	40.57	44.34	48.94

- **FTIR:**

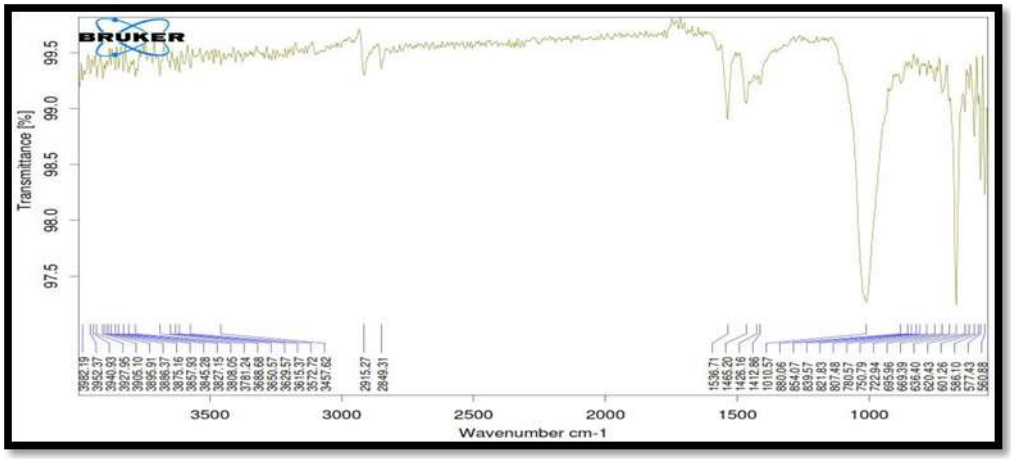


Figure: FT-IR of Prazosin HCL Pure Drug

- The Fourier transform Infra-Red Spectroscopic StudieInfrared (IR) spectra were scanning series was lies in between 400 to 4000 cm^{-1} and the resolution was 1 cm^{-1}.

- **Differential Scanning Calorimetry (DSC)**

'Differential scanning calorimetry' (DSC) can be utilized to examine and foresee any physicochemical interaction between parts in detailing and along these lines can be applied to the choice of appropriate excipients.

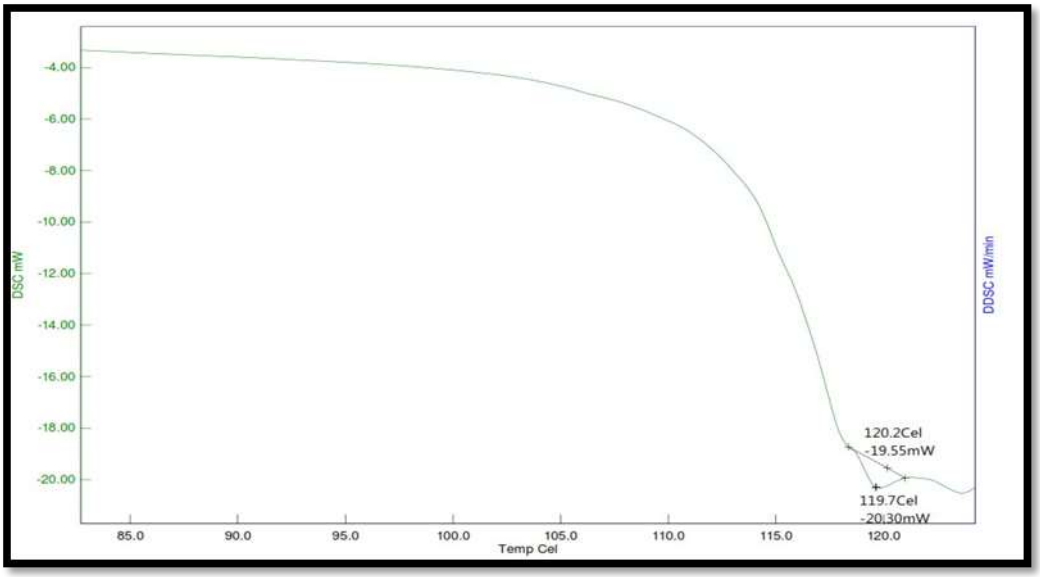


Figure: DSC of Prazosin HCL Pure Drug

Conclusion

- Form the obtained results, it can be concluded that the drugs can be easily formulated as GRDDS using different ratios of rate controlling polymers like chitosan, NaCMC, HPMC K200 and Carbopol 934.
- Chitosan is found to be promising polymer in controlling the rate and extent of drug release from the dosage form.
- Further work can be carried out to design more GRDDS.

References

1. Siraj S, Khurshid MI. Current Trends in Gastroretentive Floating Bioadhesive Drug Delivery System. 25 April 2016.

2. Rouge N, Buri P, Doelker E, Drug absorption sites in the gastrointestinal tract and dosage forms for site specific. Delivery, Int. J. Pharm. 136 (1996) 117–139

3. Streube A, Siepmann J, Bodmeier R, Drug delivery to the upper small intestine window using gastro retentive technologies, Current Opinion in Pharmacology 2006, 6:501–508.

4. Prajapati VD, Raft forming system An upcoming approach of gastroretentive drug delivery system, Journal of Controlled Release 168 (2013) 151–165.

5. Bardonnet PL , Faivre V , Pugh WJ , Piffaretti JC , Falson F . Gastro retentive dosage forms: Overview and special case of Helicobacter pylori Journal of Controlled Release 111 (2006) 1 – 18.

6. Eswer G, Saritha M, Formulation and Evaluation of Atenolol Floating Tablets Using Different Polymers:Guargum, Sodium Arun et al Journal of Drug Delivery & Therapeutics. 2019; 9(4-s):145-154 ISSN: 2250-1177 [154] CODEN (USA): JDDTAO Alginate, Hpmc100cps and Carbopol940, International Journal of Pharmaceutical & Biological Archives 2011; 2(4):1146-1151.

7. Someshwar K, Kalyani, Chithaluru K, Ramarao T, Kumar K, Formulation and evaluation of effervescent floating tablets of tizanidine hydrochloride, Acta Pharm. 61 (2011) 217–226.

8. Pattanayak D, Adepu R, Das S, Sura RS , A systemic review on Floating mucoadhesive drug delivery system, IAJPS 2018, 05 (04), 2970-2978.

9. Banker GS, Rhodes CT. Modern Pharmaceutics. Sustained and Controlled Release Delivery Systems. Marcel Dekker. 2002;4th :501-528.

10. Peddapalli H, Bakshi V, Boggula N, Formulation, in vitro and ex vivo characterization of mucoadhesive buccal tablets for antihypertensive drug, Asian J Pharm Clin Res, Vol 11, Issue 8, 2018, 402-411.

11. Hemnani M, Patel P, Patel G, Daslaniya D, Shah A, Matrix Tablets: A Tool of Controlled Drug Delivery, American Journal of Pharmatech Research. 1(4); 2249-3387:2011.

12. Sahel M, Al-Saidan, Krishnaiah YSR, Satyanarayana V. In-Vitro And In-Vivo Evaluation Of Guargum Matrix Tablets For Oral Controlled Release Of Water-Soluble Diltiazem Hydrochloride. AAPS Pharm. Sci.Tech. 6(1) ; 31-36:2005.

13. Das S, Pattanayak D , Formulation and optimization of gastro retentive drug delivery system containing Glipizide, , International Journal of Pharmacy and Pharmaceutical Sciences, ; Vol 4, Issue 1, 2012, 203-205.

14. Alhamdany AT, Abbas AAK, formulation and In vitro evaluation of Amlodipine gastroretentive floating tablets using a combination of hydrophilic and hydrophobic polymers, Int J App Pharm, Vol 10, Issue 6, 2018, 126-134.

15. Nokhodchi A, Raja S, Patel P, Asare-Addo K, The Role Of Oral Controlled Release Matrix Tablets In Drug Delivery Systems, Bioimpacts. 2(4);175-187:2012.

16. Vyas SP, Khar RK. Controlled Drug Delivery Concepts and Advances. CBS Publishers, 2001;1st:1-53.

17. Siegel RA, Rathbone MJ, Departments of Pharmaceutics and Biomedical Engineering: Chapter 2: Overview of Controlled release mechanisms, Minnepolis. 2012:19-43.

18. Bramhanker DM, Jaiswal SB, Controlled Release Medications, Biopharmaceutics And Pharmacokinetics a Treatise. Vallabh Prakashan, 1995;2nd:335-375.

19. Peppas NA. Analysis of Fickian And Non-Fickian Drug Release From Polymers. Pharm.Acta.Helv. 60(4);110-111:1985.

20. Korsmeyer RW, Gurny R, Doelker E, Peppas NA, Mechanism of Solute Release From Porous Hydrophilic Polymers. Int. J. Pharm. 15;25-35:1983.