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Research Article

FORMULATION AND IN-VITRO EVALUATION OF EPROSARTAN FLOATING TABLETS

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ABSTRACT

The Eprosartan is a selective ACE-II blocking agent which is used in the treatment of hypertension. In this study Eprosartan Floating tablets were prepared by using different polymers like HPMCK4M, HPMCK15M, HPMCK100M and CARBOPOL and HPC. Fifteen formulations of floating tablets of Eprosartan were developed by direct compression technique. The F9 formulation was found to be best of all the trials. The best formulation F9 can successfully be employed as a controlled release floating drug delivery system. The floating tablets can control the fluctuations in the plasma drug concentration, increase the gastric residence time and eventually improve the bioavailability of the drug. The FTIR study ruled out the drug-polymer interaction.

KEYWORDS: *Eprosartan, Floating tablets, Controlled release Floating drug delivery system.*

INTRODUCTION

Floating drug delivery systems: [1-3]

Floating drug delivery system is also called the hydrodynamically balanced system (HBS). Floating drug delivery systems (FDDS) have a bulk density less than gastric fluids and so remain buoyant in the stomach without affecting 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 GRT and a better control of the fluctuations in plasma drug concentration. This delivery system is further divided into in to no effervescent and effervescent (gas-generating system).

(A) Non-effervescent systems:

i. Colloidal gel barrier systems: [4-6]

Hydrodynamically balanced system (HBS), which contains drugs with gel forming hydrocolloids, was first designed by Sheth and Tossounian in 1975. These systems incorporate a high level (20- 75%w/w) of one or more gel forming, highly swellable, cellulose type hydrocolloids, polysaccharides and matrix forming polymers. On coming in contact with gastric fluid, the hydrocolloids in the system hydrate and form a colloidal gel barrier around its surface. This gel barrier controls the rate of fluid penetration into the device and consequent release of the drug.

***ii. Micro porous compartment systems*:** [7-9]

This technology is based on the encapsulation of a drug reservoir inside a micro porous compartment with apertures along its top and bottom walls. The peripheral walls of the drug reservoir compartment are completely sealed to prevent any direct contact of the gastric mucosal surface with the un dissolved drug.

iii. Multiparticulate system: Floating Beads: [10-12]

Multi-particulate drug delivery systems are mainly oral dosage forms consisting of a multiplicity of small discrete units, each exhibiting some desired characteristics. In these systems, the dosage of the drug substances is divided on a plurality of subunit, typically consisting of thousands of spherical particles with diameter of 0.05-2.00mm. Thus multi particulate dosage forms are pharmaceutical formulations in which the active substance is present as a number of small independent subunits. To deliver the recommended total dose, these subunits are filled into a sachet.

iv. Micro balloons: [13-15]

There are various approaches in delivering substances to the target site in a controlled release fashion. One such approach is using polymeric micro balloons as carrier for drugs. Hollow microspheres are known as the micro balloons. Micro balloons were floatable in vitro for 12 hrs, when immersed in aqueous media. Radio graphical studies proved that micro balloons orally administered to human were dispersed in the upper part of stomach and retained there for three hr against peristaltic movements.

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(B) Effervescent systems: [15-18]

A drug delivery system can be made to float in the stomach by incorporating a floating chamber,Which may be filled with vacuum, air or inert gas.

i. Volatile liquid containing systems: [16]

These have an inflatable chamber which contains a liquid e.g. ether, cyclopentane, that gasifies at body temperature to cause the inflation of the chamber in the stomach. These systems are osmotically controlled floating systems containing a hollow deformable unit. There are two chambers in the system first contains the drug and the second chamber contains the volatile liquid.

ii. Gas generating systems: [17]

These buoyant delivery systems utilizes effervescent reaction between carbonate/bicarbonate salts and citric/tartaric acid to liberate CO2 , which gets entrapped in the jellified hydrocolloid layer of the system, thus decreasing its specific gravity and making it float over chime. A multiple unit type of floating pills, which generate CO2, have also been developed. The system consists of a sustained release (SR) pill as seed, surrounded by double layers. The inner layer is an effervescent layer containing sodium bicarbonate and tartaric acid. The outer layer is of a swell able membrane layer containing PVA, shellac etc. Another effervescent system consisting of a collapsible spring, which controls the release of drug from the polymer matrix, has also been developed. The common approach for preparing these systems involves resin beads loaded with bicarbonate and coated with ethyl cellulose. The coating which is insoluble but permeable, allows permeation of water. Thus, carbon-dioxide is released, causing the beads to float in the stomach.

Advantages of FDDS: [18]

Floating dosage systems form important technological drug delivery systems with gastric retentive behavior and offer several advantages in drug delivery. These advantages include:

1. Improved drug absorption, because of increased GRT and more time spent by the dosage form at its absorption site.
2. Controlled delivery of drugs.
3. Delivery of drugs for local action in the stomach.
4. Minimizing the mucosal irritation due to drugs, by drug releasing slowly at controlled rate.
5. Treatment of gastrointestinal disorders such as gastro-esophageal reflux.
6. Simple and conventional equipment for manufacture.
7. Ease of administration and better patient compliance.
8. Site-specific drug delivery.

MATERIALS AND METHODS

Eprosartan, Hydroxy propyl methyl cellulose, Mannitol, Hydroxy propyl cellulose, Carbopol, Sodium Bicarbonate, Talc.

RESULTS

Table No.1: Master Formulation

Ingredients (mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9
Drug (Eprosartan)	40	40	40	40	40	40	40	40	40
HPMC K4M	20	30	40	-	-	-	-	-	-
HPMC K100	-	-	-	20	30	40	-	-	-
HPMC K15m	-	-	-	-	-	-	20	30	40
Mannitol	113	103	93	113	103	93	113	103	93
$NaHCO_3$	15	15	15	15	15	15	15	15	15
MS	8	8	8	8	8	8	8	8	8
Talc	4	4	4	4	4	4	4	4	4
Total wt of Tablet	200	200	200	200	200	200	200	200	200

Ingredients	F10	F11	F12	F13	F14	F15
Drug (Eprosartan)	40	40	40	40	40	40
HPC	20	30	40	--	--	--
Carbopol	--	--	--	20	30	40
Mannitol	113	103	93	113	103	93
$NaHCO_3$	15	15	15	15	15	15
MS	8	8	8	8	8	8
Talc	4	4	4	4	4	4
Total weight of tablet	200	200	200	200	200	200

Table No. 2: Floating time of Different Formulations

Formulation code	L.F.T (sec) {buoyancy time}	T.F.T (hrs)
F1	65	8
F2	72	12
F3	83	16
F4	69	5
F5	82	11
F6	93	12
F7	75	10

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F8	89	12
F9	102	18
F10	64	10
F11	76	11
F12	99	14
F13	96	12
F14	124	16
F15	154	20

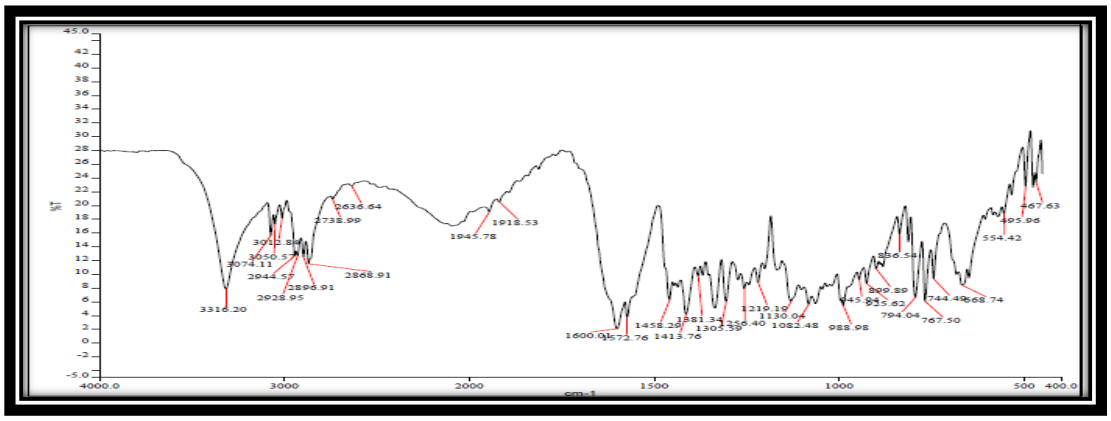

Fig. 1: FTIR Spectra of Eprosartan

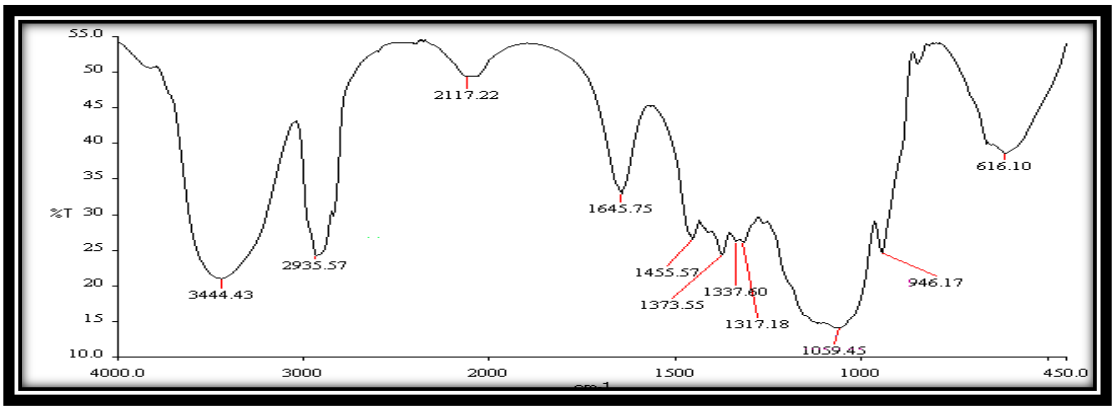

Fig. 2: FTIR Spectra of Eprosartan+ Hpmc

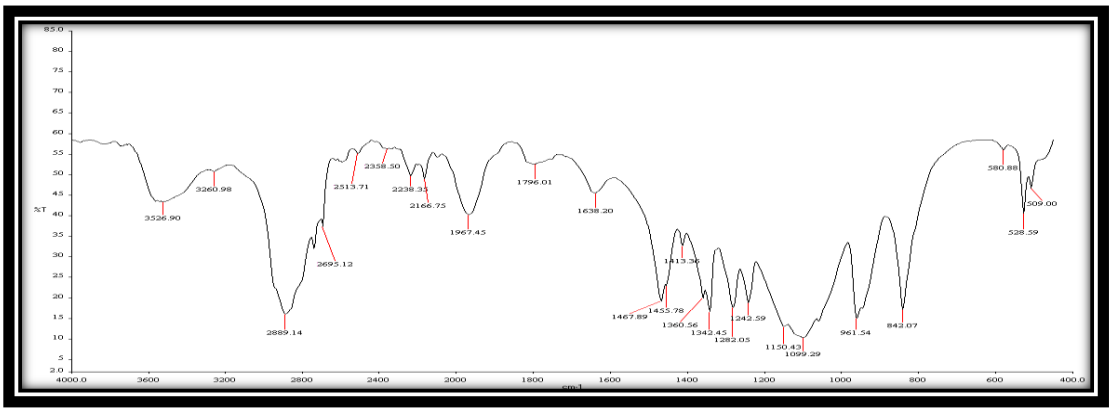

Fig. 3: FTIR Spectra of Eprosartan+ Carbopol

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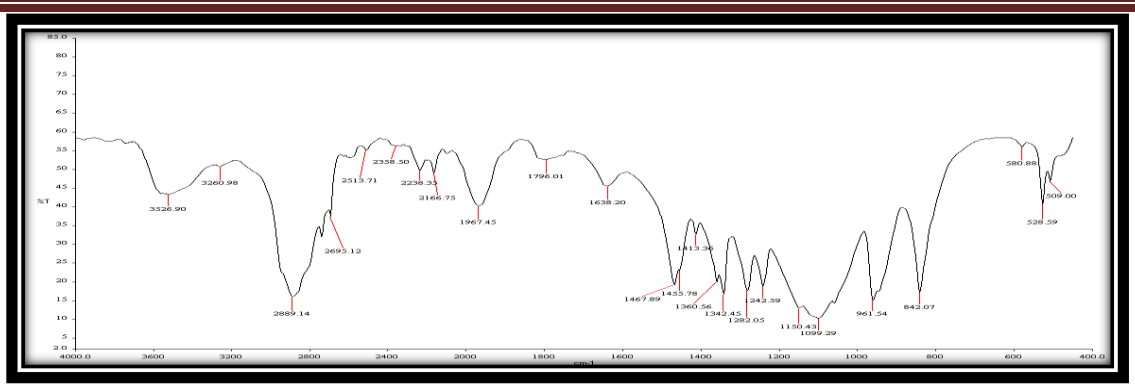

Fig. 4: FTIR Spectra of Eprosartan+ HPC

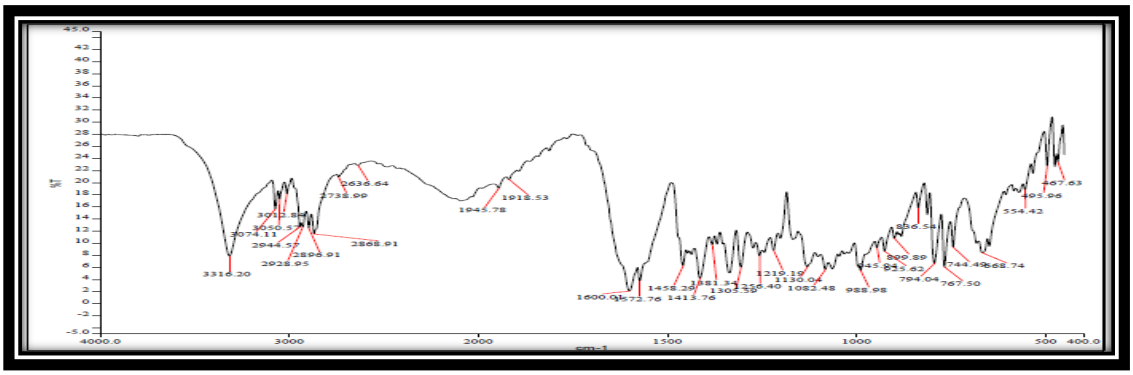

Fig. 5: FTIR Spectra of Optimized formula

Table No. 3: Standard curve of Eprosartan

Conc. in µg	Absorbance at 255.6nm
0	0
2	0.119
4	0.245
6	0.367
8	0.488
10	0.603
12	0.726
14	0.848
16	0.98

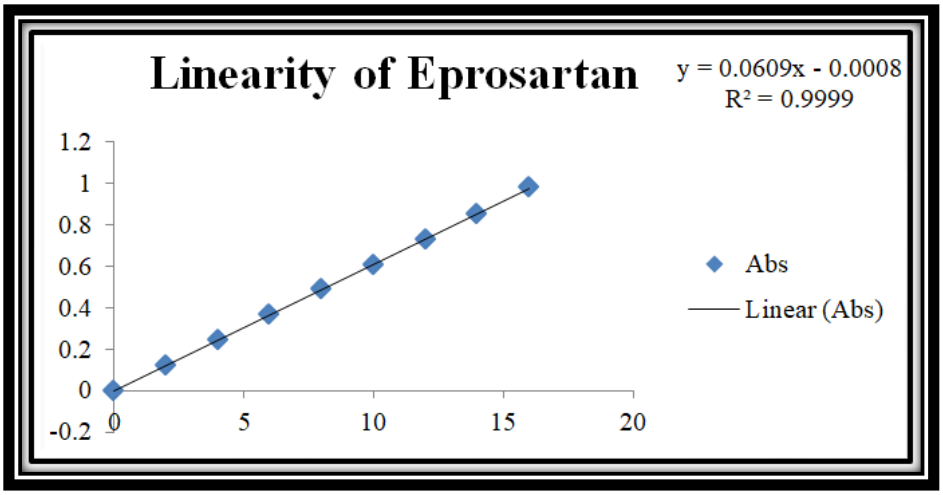

Fig. 6: Standard calibration curve of Eprosartan

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Table No. 4: Flow properties of all formulations F1-F15

Formulation	Angle of Repose (⁰) θ= tan⁻¹ (h/r)	Loose bulk Density (LBD) (g/ml)	Tapped bulk Density (TBD) (g/ml)	Carr's index %	Hauser's ratio
F1	21⁰04	0.304	0.351	13.41	1.15
F2	21⁰09	0.317	0.367	13.63	1.15
F3	21⁰46	0.310	0.360	13.89	1.16
F4	24⁰88	0.318	0.378	15.87	1.18
F5	24⁰23	0.294	0.346	15.02	1.17
F6	24⁰09	0.307	0.360	14.72	1.17
F7	24⁰78	0.311	0.368	15.21	1.18
F8	24⁰56	0.265	0.312	15.06	1.17
F9	23⁰98	0.332	0.391	14.91	1.17
F10	23⁰02	0.328	0.386	15.02	1.17
F11	24⁰05	0.330	0.376	12.23	1.13
F12	24⁰24	0.335	0.382	12.30	1.14
F13	23⁰08	0.325	0.388	16.23	1.19
F14	23⁰12	0.331	0.386	14.24	1.16
F15	24⁰14	0.328	0.380	13.68	1.15

Table No. 5: Dissolution studies of all Formulations F1-F15

	1hr	2hr	4hr	6hr	8hr	10hr	12hr	14hr	16hr
F1	27.23	41.9	66.12	91.86	96.18	--	--	--	--
F2	22.54	35.12	50.34	63.87	77.02	96.56	--	--	-
F3	18.03	27.8	37.76	51.47	64.43	78.9	91.86	96.74	--
F4	37.42	61.94	94.77	--	--	--	--	--	--
F5	24.44	35.82	49.44	70.89	85.82	95.34	--	--	--
F6	19.6	32.46	50.56	65.67	78.36	89.55	96.26	---	--
F7	34.32	55.22	75.74	89.18	97.01	--	--	--	--
F8	28.73	45.9	61.94	73.5	85.07	95.9	--	--	--
F9	17.16	26.86	36.94	48.88	60.44	69.4	78.54	87.31	98.5
F10	23.88	32.46	47.76	72.57	95.52	--	--	--	--
F11	21.26	28.73	43.65	61.56	87.31	97.2	--	--	--
F12	16.23	24.99	33.76	51.11	66.23	87.87	98.13	--	--
F13	25.37	41.6	55.59	80.41	94.02	97.76	--	--	--
F14	28.73	32.46	46.08	56.15	71.26	80.22	91.6	96.82	--
F15	17.72	26.86	36.19	43.47	57.64	69.77	78.54	90.67	97.94

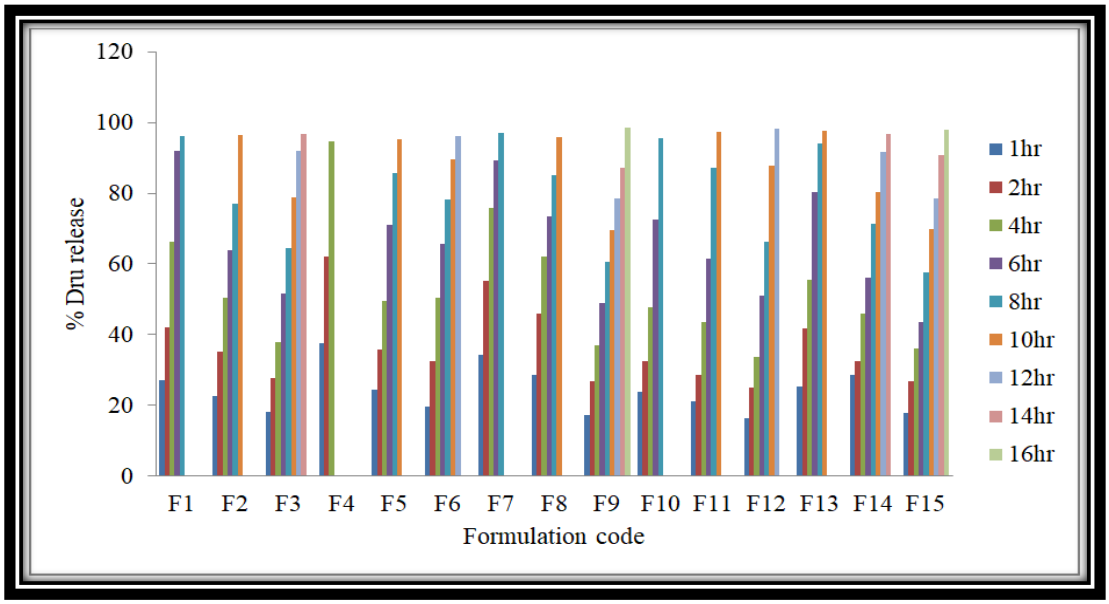

Fig. 7: Dissolution profile of all Formulations F1 to F15

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Table No. 6: Evaluation parameters of All Formulations F1-F15

Formulation	Uniformity of Weight mg	Hardness Kg/cm²	Diameter (mm)	Friability (%)	Drug content (%)
F1	201	5.1	8.7	0.435	98.70
F2	200	5.4	8.7	0.492	99.25
F3	199	5.3	8.7	0.501	99.42
F4	200	5.5	8.7	0.463	98.52
F5	201	5	8.7	0.478	98.24
F6	202	5.2	8.7	0.342	98.63
F7	198	5.5	8.7	0.414	98.15
F8	200	5.5	8.7	0.417	99.42
F9	200	5.2	8.7	0.318	99.14
F10	198	5.1	8.7	0.412	98.46
F11	199	5.2	8.7	0.416	98.10
F12	204	5.2	8.7	0.514	98.65
F13	201	5.1	8.7	0.355	98.32
F14	198	5.3	8.7	0.411	98.65
F15	202	5.1	8.7	0.441	98.02

SUMMARY AND CONCLUSION

The Eprosartan is a selective ACE-II blocking agent which is used in the treatment of hypertension. In this study Eprosartan tablets were prepared by using different polymers like HPMCK4M, HPMCK15M, HPMCK100M and CARBOPOL and HPC. Fifteen formulations of floating tablets of Eprosartan were developed by direct compression technique. The F9 formulation was found to be best of all the trials. The best formulation F9 can successfully be employed as a controlled release floating drug delivery system. The floating tablets can control the fluctuations in the plasma drug concentration, increase the gastric residence time and eventually improve the bioavailability of the drug. The FTIR study ruled out the drug-polymer interaction.

REFERENCES:

1. Friend DR. Oral delivery: A new approach to dosage forms. Pharmaceutical News **2006**;9:375-80.
2. Robinson JR, Lee VHL. Controlled drug delivery: fundamentals and applications, Marcel Dekker: New York: **1978**;2:335- 410.
3. Brahmankar DM, Jaiswal SB. Biopharmaceutics and pharmacokinetics a treatise. New Delhi; Vallabh Prakashan: New Delhi: **1995**;1:10-48.
4. Chein YW. Novel drug delivery systems. Marcel Dekker, New York; **1992**;2:185-210.
5. Lalla JK. Introduction to controlled release and oral controlled drug delivery systems. The Eastern Pharmacist **1991**;45:25-28.
6. Brahmaiah Bonthagarala, Varun Dasari, Vijay Kotra, Suryakanta Swain. Quality by Design based development and characterization of Pioglitazone loaded liquisolid compact tablets with improved biopharmaceutical attributes. J Drug Deliv Sci & Tech **2019**;51:345-355.
7. Banker GS, Rhodes CT. Modern Pharmaceutics. Marcel Dekker, New York **1996**;3:125-128.
8. Brahmaiah.B, Madhu Gudipati, GP Bhagath. Formulation and Evaluation of Gastro retentive Floating Drug Delivery System of Metoprolol Tartarate. Int J Life Sci Biotech & Pharm Res **2013**;2(1):184-201.
9. Brahmaiah.B, Sasikanth Kothamasu, Sreekanth Nama. Formulation and evaluation of extended release mucoadhesive microspheres of Rosuvastatin. Int J Biol & Pharm Res **2013**;4(4):271-281
10. Brahmaiah Bonthagarala, Sreekanth Nama, Leela Madhuri Pola. Enhancement of Dissolution Rate of Ciprofloxacin by Using Various Solid Dispersion Techniques. Int J Pharm Sci & Res **2013**;4(11):4376-4383.
11. Brahmaiah B, Prasanna Kumar Desu, Sreekanth Nama, S. Satish Babu. Formulation and evaluation of extended release mucoadhesive microspheres of simvastatin. Int J Pharm & Biomed Res **2013**;4(1):57-64.
12. AJ. Gastric retention systems for oral drug delivery. Business Briefing. Pharmatech **2003**;157-9.
13. AJ. Gastroretentive dosage forms. Crit Rev Ther Drug Carrier Syst **1993**;10(2):193-95.
14. Well LJ, Gardner RC, Cargill RC. Drug delivery device which can be retained in the stomach for a controlled period of time. US Patent **1998**;4:767, 627.
15. Grabowski SR. Principles of anatomy and physiology. 10th Ed. New York: John Willey and Sons; **2002**.
16. KRW, Waugh A. Anatomy and Physiology in Health and Illness. 9th ed. London: Churchill Livingstone; **1996**.
17. Davis SS, Stockwell AF, Taylor MJ, Hardy JG, Whalley DR, Wilson CG, Echrgaard H, Cristen FN. The effect of density on the gastric emptying of single and multiple-unit dosage forms. Pharm Res **1986**;3:208.
18. Brahmaiah Bonthagarala, Pasam Venkateswara Rao, GV. Pavan Kumar. Formulation and Evaluation of Gastro retentive Floating Drug Delivery System of Atenolol. Mintage J Pharm & Med Sci **2014**;3(Suppl 3):24-28.

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