WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 7.523
Volume 6, Issue 7, 1073-1079. Research Article ISSN 2277– 7105

FORMULATION AND EVALUATION OF ATENOLOL ORAL DISINTEGRATING TABLETS

G. Sandhyarani*, J. Srikanth and M. Sarangapani

University College of Pharmaceutical Sciences, Kakatiya University, Warangal. India.

Article Received on
22 April 2017,

Revised on 12 May 2017,
Accepted on 01 June 2017

DOI:10.20959/wjpr20177-8755

***Corresponding Author**
Dr. G. Sandhyarani
University College of Pharmaceutical Sciences, Kakatiya University, Warangal. India.,

ABSTRACT

Orodispersible dosage forms are used for accurate dosing, enhanced bioavailability, rapid action, patient compliance, easy of administration, enhanced palatability. The aim of the experiment is to formulate metaprolol tartrate oral disintegrating tablets using different superdisintigrants like (Sodium starch glycolate (SSG), Croscarmellose sodium (CCS), Crospovidone (CP), Low-subsitituated hydroxypropyl cellulose (L-HPC). 12 formulations of tablets were prepared using direct compression method and the formulated tablets were subjected to different physicochemical evaluation tests like hardness, weight variation, disintegration, thickness, drug content uniformity, water absorption ration, wetting time and In vitro dissolution. From the results of drug release and disintegration time formulation F9 containing, crosspovidine 5% as superdisintegrant was selected as the optimized formula for the formulation of disintegration tablets of metaprolol tartrate.

OBJECTIVE

- To prepare and evaluate different formulations (12) of Atenololoral disintegrating tablets by using different super-disintegrants (Sodium starch glycolate (SSG), Croscarmellose sodium (CCS), Crospovidone (CP), Low-subsitituated hydroxypropyl cellulose (L-HPC).
- From these formulations optimized formulation is selected based on release characteristics and it is compared with normal conventional tablet.

Rationale of work

- To disintegrate tablets in mouth with in 1 minute.
- To improve patient compliance.

Plan of work

- To identify the phsicochemical interaction between drug and carrier by Fourier Transform Infrared Spectroscopy (FTIR).
- Evaluation tests for the Precompression blend.
- To formulate Atenololoral disintegrating tablets.
- Preparation of orally disintegrating tablets by direct compression method using different superdisintegrants like sodium starch glycolate, croscarmellose sodium, crospovidone, L-HPC at different concentrations.
- Evaluation of prepared oral disintegrating tablets.
- Selection of the best formulation of tablets based on the ***invitro disintegration time and invitro dissolution*** **studies** and comparing with marketed product.

METHODS

Constrution of standard graph of Atenolol

pH 6.8 phosphate buffer in a 100 ml volumetric flask (1000µg/ml)dissolve100 mg of Atenolol.

10ml of this solution was taken and made up to 100ml with pH 6.8 phosphate buffer which gives 100µg/ml concentration (stock solution). 10ml of above stock solution was taken and made up to 100 ml with pH 6.8 phosphate buffer which gives 10µg/ml concentration (stock solution).

From this stock solutions concentrations of 2,4,6,8,10,12,14, 16,18,20,22,24 and 26 µg/ml in pH 6.8 phosphate buffer were prepared. The absorbance of the diluted solutions was measured at 275 nm and a standard plot was drawn using the data obtained.

Preparation of Atenolol tablets

Ingredients (mg)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Drug	25	25	25	25	25	25	25	25
Sodium starch glycolate(SSG)	4.5	6	7.5	-	-	-	-	-
Croscarmellose Sodium(CCS)	-	-	-	4.5	6	7.5	-	-
Crospovidone(CP)	-	-	-	-	-	-	4.5	6
L-HPC	-	-	-	-	-	-	-	-
MCC-102	30	30	30	30	30	30	30	30
Talc	2	2	2	2	2	2	2	2
Sodium stearyl fumerate	1	1	1	1	1	1	1	1

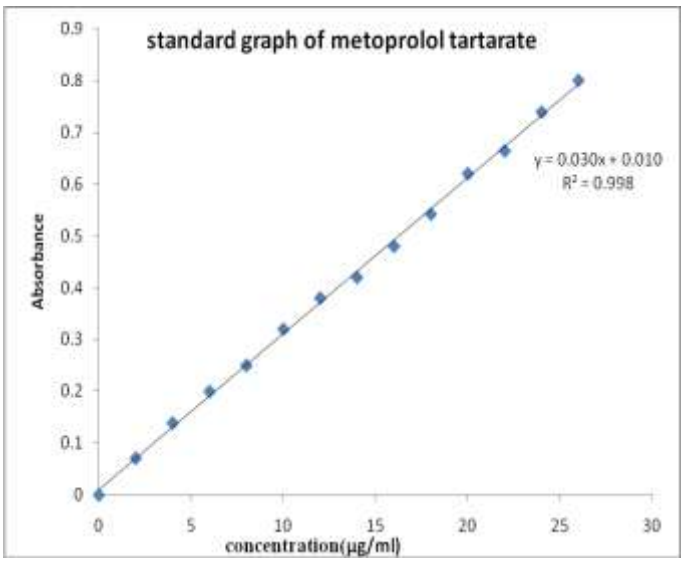
Pearlitol SD-200	84.5	83	81.5	84.5	83	81.5	84.5	83
Aspartame	3	3	3	3	3	3	3	3
Total weight	150mg	150mg	150mg	150mg	150mg	150mg	150mg	150mg

Ingredients(mg)	**F9**	**F10**	**F11**	**F12**
Drug	25	25	25	25
Sodium starch glycolate(SSG)	-	-	-	-
Croscarmellose Sodium (CCS)	-	-	-	-
Crospovidone(CP)	7.5	-	-	-
L-HPC	-	4.5	6	7.5
Mcc-102	30	30	30	30
Talc	2	2	2	2
Sodium steryl fumerate	1	1	1	1
Pearlitol SD-200	81.5	84.5	83	81.5
Aspartame	3	3	3	3
Total weight	150mg	150mg	150mg	150mg

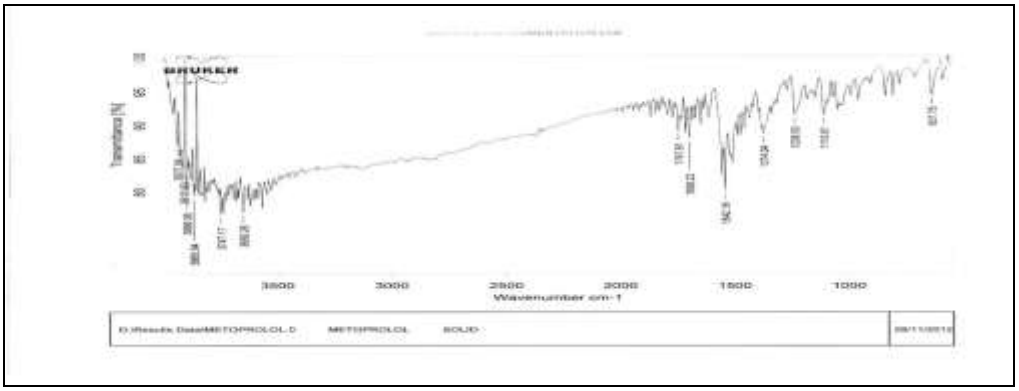
RESULTS AND DISCUSSION

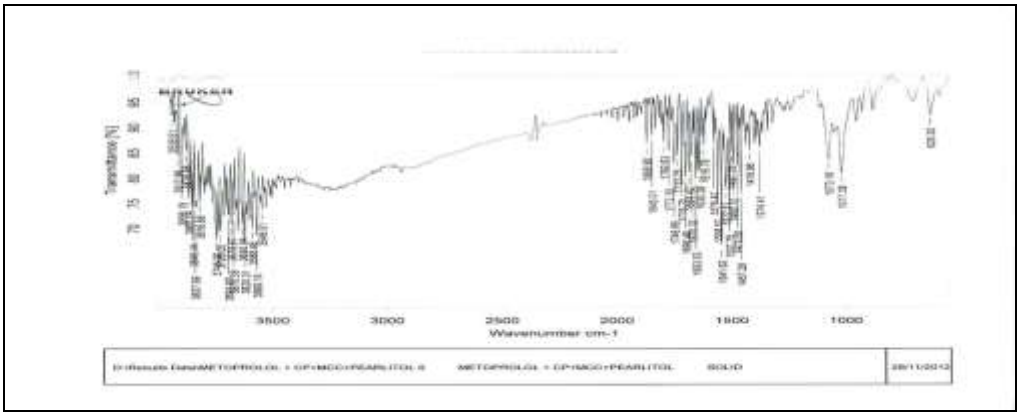
Standard graph of Metoprolol tartarate in 6.8 pH buffer

Concentration (µg/ml)	**Absorbance**
0	0
2	0.071
4	0.139
6	0.2
8	0.25
10	0.32
12	0.38
14	0.42
16	0.48
18	0.542
20	0.62
22	0.664
24	0.739
26	0.8



FTIR of Metoprolol tartarate drug and optimized formulation





SI No.	IR spectrum	Peak area (cm^{-1})	Functional groups	Stretching/ Deformation
1	Metoprolol Tartarate	1374.04	N-H (3^o Amine)	Stretching Vibration
		1698.22	COOH	Stretching Vibration
		1542.16	C-O	Stretch
2	F9 (Drug + crospovidone + Other excipients)	1374.41	N-H (3^o Amine)	Stretching Vibration
		1698.48	COOH	Stretching Vibration
		1541.62	C-O	Stretch

Evaluation of Pre-compression Blend

Formulation	Angle of Repose ± SD	Bulk Density ± SD	Tapped Density ± SD	Compressibility Index ± SD	Hausner's Ratio ± SD
F1	25.8±0.04	0.52±0.01	0.62±0.04	16±0.35	1.19±0.09
F2	24.9±05	0.53±0.23	0.61±0.08	13±0.11	1.15±0.03
F3	24±0.09	0.53±0.2	0.64±0.09	17±0.11	1.20±0.06
F4	23.8±0.14	0.50±0.13	0.63±.09	20±0.51	1.26±0.03
F5	24.2±0.08	0.54±0.12	0.65±0.07	16±0.11	1.20±0.07
F6	24.4 ±0.07	0.52±0.13	0.63±0.08	17±0.33	1.21±0.4
F7	25.5±0.04	0.51±0.1	0.62±0.08	17±0.52	1.21±0.08
F8	24.9±0.08	0.53±0.13	0.63±0.08	15±0.31	1.18±0.2
F9	26.5±0.05	0.52±0.34	0.65±0.08	18±0.11	1.25±0.03
F10	23.7±0.03	0.51±0.3	0.62±0.03	17±0.17	1.21±0.05
F11	25.5±0.02	0.55±0.13	0.65±0.8	15±0.19	1.14±0.03
F12	24.8±0.04	0.52±0.32	0.62±0.05	16.6±0.10	1.19±0.02

Evaluation of Prepared Metoprolol tartarate Oral Disintegrating Tablets

Formulation	Hardness (Kg/cm^2) ± SD	Thickness (mm) ± SD	Friability	Weight Variation ± SD	Drug Content ± SD
F1	2.2±0.1	3.1±0.01	0.63	151.6±0.5	95.6±1.25
F2	2.2±0.1	3.2±0.08	0.69	149.66±0.08	102.2±2.99
F3	2.3±0.1	3.2±0.02	0.72	152.38±0.5	96.36±1.33
F4	2.2±0.1	3.0±0.03	0.81	152±0.5	99.83±1.40
F5	2.3±0.1	3.2±0.04	0.87	149±1.0	99.6±3.10
F6	2.4±0.2	3.2±0.09	0.89	151±1.0	98.80±1.63
F7	2.3±0.1	3.0±0.03	0.90	150±1.5	98.8±1.49

F8	2.4±0.1	3.2±0.01	0.95	152±0.5	100.6±2.66
F9	2.3±0.1	3.1±0.07	0.76	151±0.8	100.1±1.77
F10	2.3±0.2	3.1±0.03	0.87	148±0.9	99.9±1.21
F11	2.3±0.1	3.2±0.03	0.75	150±1.5	102.5±1.15
F12	2.3±0.1	3.0±0.04	0.81	150±0.7	100.5±0.96

Evaluation of Prepared Metoprolol tartarate Oral Disintegrating Tablets

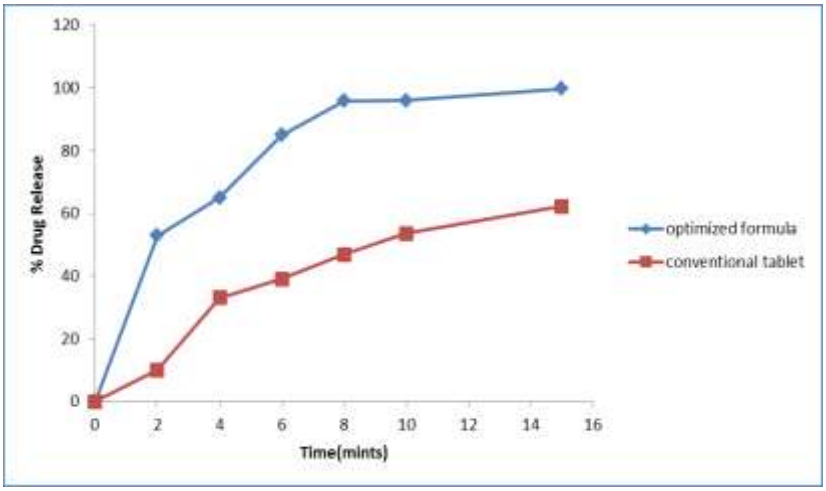
Formulation	Wetting Time (sec) ± SD	Water Absorption Ratio (WAR) ± SD	*In vitro* Disintegration Time (sec) ± SD
F1	43.63±0.058	70±2.7	29.71±1.5
F2	36.61±0.058	90.33±2.2	28.43±0.5
F3	32.91±0.06	107.33±0.01	26.23±0.5
F4	36.66±0.02	82.2±0.03	32.98±0.47
F5	34.83±0.058	92±0.01	28.95±0.6
F6	32.88±0.76	107±0.02	22.70±0.6
F7	41.46±0.57	100±0.01	24.83±0.6
F8	45.30±0.57	105±0.01	23.2±0.6
F9	23.60±0.57	115±0.01	20±0.7
F10	45.91±0.57	85±0.05	27.48±0.6
F11	42.36±1.02	97±0.02	25.63±0.6
F12	40.33±0.50	110±0.01	24.71±0.6

***In vitro* Drug Release Studies of Prepared Tablets at Different Concentrations of SSG and CCS**

Time (min)	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0
2	38.56±1.1	53.8±1.20	49.08±2.58	32.97±2.15	26.54±1.72	46.46±2.58
4	63.6±0.60	64.8±0.69	53.07±0.86	58.4±1.72	41.6±1.72	55.59±0.86
6	73.2±1.64	76.81±0.6	84.56±1.29	60.16±2.58	68.51±3.01	81.38±1.29
8	80.4±1.59	85.2±1.29	91.03±0.86	76.16±0.43	74.38±1.29	89.69±0.86
10	85.2±1.61	92.4±1.39	94.80±3.01	82.38±0.43	82.38±2.15	93.99±3.01
15	89.9±1.59	97.5±0.86	95±2.58	90.38±0.43	92.29±0.86	98.29±2.58

***In vitro* Drug Release Studies of Prepared Tablets at Different Concentrations of CP and L-HPC**

Time (min)	F7	F8	F9	F10	F11	F12	Marketed
0	0	0	0	0	0	0	0
2	23.8±2.15	45.8±1.72	52.46±2.58	42.8±2.15	38.8±1.72	29±2.58	10.56±1.2
4	56.2±1.72	49.2±1.72	65.59±0.86	50.7±1.72	58±1.72	53.07±0.8	33±2.5
6	73.79±2.58	63.61±3.0	85.8±1.29	63±2.58	74±3.01	60.5±1.29	39±1.6
8	77.9±0.43	76.8±1.29	95.9±0.86	70.56±0.43	86±1.29	69.2±0.86	46.9±1.8
10	92.48±0.43	80.48±2.1	96.0±3.01	90.12±0.43	92.4±2.15	96.09±3.0	53.5±1.3
15	97.48±0.43	96±0.86	99.7±2.58	93.72±0.43	94.99±0.8	97.29±2.5	62.2±1.9



Comparison of optimised formula and conventional tablet

CONCLUSION

- IR-spectroscopic studies indicate that there are no drug exipients interactions.
- Tablets prepared by direct compression method were without any chipping, capping and sticking.
- The percentage friability was less than 1 % in all the cases.
- Weight variation was less than ±7.5%, the results suggesting the tablets prepared were uniform in weight
- *In vitro* Disintegration time was in the range of 20±0.7 sec to 32.98±0.6 sec
- Increased concentration of super disintegrants increases water absorption ratio and decreases wetting time.
- *In vitro* drug release studies showed that, the best formulation (F9) containing Crospovidone 5% released 99.7±2.5% of drug within 15 min, which is more when compared with normal conventional Metoprolol Tartarate (25mg),the drug release in 15min is only 62.2%.
- Finally optimized formulation(F9) was better than conventional formulation, so it is suggested that it is better to go Atenololdrug as oral disintegrating tablet than normal conventional tablet i.e because of better release, with less disintegration time and convenience of usage.

REFERENCES

1. Shravan kumarY, Sunil kumar B, Madhusudhan Roa Y, Advances in Drug Delivery 2: Oral disintegrating tablets, 57-105.
2. Jha SK, Geethalakshmi A, Bhatia V, Shukla TP, Orally Disintegrating tablets- technology for mankind, J Global pharm Tech., 2010; 2(4): 11-17.

3. Abdelbary G, Prinderre P, Eouani C, Joacchim J, Reynier JP and Piccerelle P. The preparation of orally disintegrating tablets of Atenololusing mcc as binder, *Int J Pharm.*, 2004; 278: 423-33.
4. James Klancke, dissolution testing of oral disintegrating tablets, Cima Labs, 2003; 1.
5. Shravan kumarY, Sunil kumar B, Madhusudhan Roa Y, Advances in Drug Delivery volume-2: Oral disintegrating tablets, 57-105.
6. Amit Kumar Nayak and Kaushik Manna, Current developments in orally disintegrating tablet technology, J Pharm Educ Res., June 2011; 2.
7. Abdelbary G, Prinderre P, Eouani C, Joacchim J, Reynier JP and Piccerelle P. The preparation of orally disintegrating tablets of Atenololusing mcc as binder, *Int J Pharm.*, 2004; 278: 423-33.
8. James Klancke, dissolution testing of oral disintegrating tablets, Cima Labs, 2003; 1.
9. Sunil Kumar Battu, Rao Ym, Formulation and evaluation of rapid disintegrating tablets of Fenoverine; effect of superdisintegrants, 2007.
10. Ashok.k, Design and evaluation of ODT of Metoprolol tartarate, IJPSR, 2011; 1.
11. Indian Pharmacopoeia, The Controller of Publication. Delhi, 1996; 2: 735.
12. B. P. Patel, Formulation and evaluation of mouth dissolving tablets of Cinnarizine, Indian journal of pharmaceutical sciences, Jul-Aug, 2010; 72(4): 522–525.
13. Drug Bank, ATENOLOL(DB00448).
14. Brahmankar DM, Jaiswal SB, Biopharmaceutics and Pharmacokinetics, 1st edition, Delhi; Vallabh prakashan; 1995. British Pharmacopoeia, 2011.
15. Rajitha k, Shravan kumar Y, Y.M Roa, Formulation and evaluation of oral disintegrating tablets of Buspirone, International Journal of Pharmaceutical sciences and Nanotechnology, 2009.