e- ISSN 0976-0342
Print ISSN 2229-7456

International Journal of Pharmacy & Therapeutics

Journal homepage: www.ijptjournal.com

Research article

DESIGN AND IN VITRO CHARACTERIZATION OF NARATRIPTAN BUCCOADHESIVE TABLETS FOR THE TREATMENT OF MIGRAINE

Gollapudi Rajesh[1*], Paladugu Sujitha[2], Md Parveen[3], B.Indraja[3]

[1]Department of Pharmaceutics, Max Institute of Pharmaceutical Sciences, Khammam, Telangana, India.
[2]Department of Pharmaceutical analysis, Max Institute of Pharmaceutical Sciences, Khammam, Telangana, India.
[3]Department of Pharmaceutics, Max Institute of Pharmaceutical Sciences, Khammam, Telangana, India.

ABSTRACT

The main objective of this study is that the release rate of drug from the buccal tablets can be governed by the polymer and concentration of the polymer employed in the preparation of tablets. Regulated drug release in first order manner attained in the current study indicates that the hydrophilic matrix tablets of Naratriptan was prepared by using Carbopol 934 and HPMC K100 can successfully be employed as a buccoadhesive controlled released during delivery system. The precompression blends for all formulations were subjected to various evaluation parameters and the results were found to be within limits. The post compression parameters for all the formulations also found to be within limits. Slow, controlled and complete release of Naratriptan over a period of 9 hours was obtained from matrix tablets formulated employing HPMC K 100 (F5 formulation) with 97.62 % drug release.

Key Words:-Naratriptan, Buccoadhesive, Migraine.

Access this article online

Home page: http://ijptjournal.com/

DOI: http://dx.doi.org/10.21276/ijpt.2017.8.4.7

Quick Response code

Received:25.08.17 **Revised**:12.09.17 **Accepted**:15.09.17

Corresponding Author

Gollapudi Rajesh
Department of Pharmaceutics, Max Institute of Pharmaceutical Sciences, Khammam, Telangana, India.

Email:-rajeshgollapudi@yahoo.com

INTRODUCTION

Mucoadhesive Dosage Forms

The primary objectives of mucoadhesive dosage forms are to provide intimate contact of the dosage form with the absorbing surface and to increase the residence time of the dosage form at the absorbing surface to prolong drug action. Due to mucoadhesion, certain water-soluble polymers become adhesive on hydration and hence can be used for targeting a drug to a particular region of the body including the buccal mucosa, gastrointestinal tract, the urogenital tract, the airways, the ear, nose and eye (Shabaraya AR *et al.*, 2012; Borgaonkar PA *et al.*, 2011; Mahalaxmi D *et al.*, 2010; Sudhakar B and Mohideen S, 2010) .

AIM AND OBJECTIVE

Buccal drug delivery has been considered as an alternative to oral dosing for compounds subjected to degradation in the gastrointestinal tract or to hepatic first pass metabolism. Buccal drug delivery offers a safer mode of drug utilization, since drug absorption can be promptly terminated in cases of toxicity by removing the dosage form from the buccal cavity. From a technological point of view, an ideal buccal dosage form must have three properties; It must maintains its position in the mouth for a few hours, release the drug in a controlled fashion and provide drug release in a unidirectional way towards the mucosa (Guda A *et al.*, 2010; Iman SJ and Nidhal K, 2014; Naga RK *et al.*, 2011; Pethe M and Salunkhe SP, 2014).

Naratriptan is a triptan drug used for the treatment of migraine headaches. It is a selective 5-hydroxytryptamine1 receptor subtype agonist (Muthukumaran M *et al.*, 2013; Suresh KP *et al.*, 2011;

Velmurugan S *et al.,* 2010; Sachin SD *et al.,* 2014; Satyabrata B *et al.,* 2014).

first-pass metabolism for improvement in bioavailability, to reduce the dosing frequency and to improve patient compliance. Tablets of Naratriptan were prepared by direct compression method using bioadhesive polymers like Carbopol 934P, HPMC K15, HPMC K100 either alone or in combinations with backing layer of ethyl cellulose (Sellappan V and Srinivas P, 2013; Swapnil RC and Amol AH, 2012; Vaidya VM *et al.,* 2009; Vaishali AC *et al.,* 2013).

MATERIALS AND METHOD

Naratriptan gift sample from Natco laboratories, Hyderabad and microcrystalline from Singent chemicals from Mumbai, Magnesium stearate, Ethyl cellulose, talc carbapol, HPMCK15M, HPMCK100M from Merck specialties from Mumbai.
Method is direct compression.

RESULTS AND DISCUSSION

The main aim of this work was to develop buccoadhesive tablets to release the drug at buccal mucosal site in unidirectional pattern for extended period of time without wash out of drug by saliva. Carbopol 934, HPMC K15, HPMC K 100 were selected as buccoadhesive polymers on the basis of their matrix forming properties and mucoadhesiveness, while ethyl cellulose, being hydrophobic, used as a backing material. Ethyl cellulose has recently been reported to be an excellent backing material, given its low water permeability and moderate flexibility.

Precompression Evaluation Parameters Of Tablets

Formulations blend of all the formulations were passed the precompression parameters like angle of repose, bulk density, tapped density and Hausners ratio.

The assayed drug content in various formulations varied between 98.64% and 100.26% (mean 99.68%). The average weight of the tablet was found to be between 281.4 mg and 283.2 mg (mean 280.2 mg), % friability range between 0.46 and 0.76(mean 0.43 %) and thickness of the tablets for all the formulations was found to be between 2.80 mm and 3.00 mm with average of 2.90 mm. Buccoadhesive tablets containing Carbopol showed hardness in the range of 5.00 to 5.60 kg/cm ^{2} and it increased when used in combination with HPMC k100.

The aim of the present study was to design buccoadhesive tablets to release the drug unidirectional in buccal cavity for extended period of time in order to avoid The hardness of the tablets containing HPMC K15 was much lower, ranging from 4.30 to 4.8 kg/cm^2 and increased with increasing amounts of HPMC or Carbopol. The difference in the tablet strengths are reported not to affect the release of the drug from hydrophilic matrices. Drug is released by diffusion through the gel layer and/or erosion of this layer and is therefore independent of the dry state of the tablet.

In-Vitro Drug Release Studies

In vitro drug release studies revealed that the release of Naratriptan from different formulations varies with characteristics and composition of matrix forming polymers. The release rate of Naratriptan decreased with increasing concentrations of the polymers. The Release rate of the tablets decreased from F1 to F3 when tablets are prepared with HPMC K15 in 1:1, 1:1.5 and 1:2 ratios respectively.

The release rates were similarly studied with increasing concentrations of HPMC K100 and the release rate decreased with increasing concentrations from F4 to F6 respectively. Similarly release rates were studied with Carbopol 934 in increasing concentrations i.e. 1:1, 1:1.5, and 1:2 and release rate was found to be decreased with all the three polymers when used in the ratio 1:2.

Among all the formulations Formulation F5 containing HPMC K100 M in the concentration of 1:1.5 was found to be good with better drug release i.e., 93.62% in 9 hours. Several kinetic models describing drug release from immediate and modified released dosage forms. The model that best fits the release data was evaluated by correlation coefficient (r). The correlation coefficient (r) value was used as criteria to choose the best model to describe the drug release from the buccoadhesive tablets. The 'r' values obtained for fitting the drug release data to first order, indicating that the drug release mechanism follows first order kinetics. From higuchi's equation, the high values of correlation coefficient 'r' indicating that the drug release mechanism from these tablets was diffusion controlled. The values of 'n' in Peppas model indicated the drug release follows non-Fickian diffusion.

From the above results it is concluded that the drug release from the formulated buccoadhesive tablets of Naratriptan followed Higuchi release kinetics and was diffusion controlled.

Table 1. Micromeritic properties of powder blend

Formulation Code	Bulk density	Tapped density	Compressibility Index	Hausner's ratio
F1	0.49±0.07	0.57±0.01	16.21±0.06	0.86±0.06
F2	0.56±0.06	0.62±0.05	16.87±0.05	0.98±0.05
F3	0.52±0.03	0.68±0.07	17.11±0.01	0.64±0.03
F4	0.54±0.04	0.64±0.08	17.67±0.08	1.12±0.04

F5	0.53±0.06	0.67±0.03	16.92±0.04	1.2±0.08
F6	0.56±0.05	0.66±0.06	17.65±0.09	1.06±0.09
F7	0.58±0.06	0.69±0.04	16.43±0.05	0.76±0.03
F8	0.48±0.05	0.57±0.02	17.97±0.02	1.15±0.09
F9	0.54±0.08	0.62±0.03	17.54±0.09	1.17±0.02

Table 2. Evaluation Data of Naratriptan Buccoadhesive tablets

Formulation code	Hardness (kg/cm)	Thickness (mm)	Weight variation (mg)	Friability (%)	Drug content (%)
F1	4.8±0.02	2.80±0.00	279.6±0.99	0.79±0.01	100.09±0.56
F2	4.3∓0.05	2.83±0.06	278.8±0.99	0.67±0.01	102.73±0.46
F3	4.3±0.05	2.87±0.06	279.8±0.38	0.57±0.01	98.75±0.88
F4	5.7±0.06	2.86±0.06	280.7±0.99	0.55±0.00	99.70±0.34
F5	5.4±0.03	2.87±0.06	279.8±0.38	0.51±0.01	97.95±0.38
F6	5.0±0.02	2.90±0.00	280.1±0.99	0.87±0.03	98.75±0.88
F7	5.6±0.07	2.97±0.06	279.6±0.17	0.46±0.01	103.36±0.83
F8	5.3±0.05	3.01±0.01	281.0±0.40	0.72±0.01	101.09±4.00
F9	5.1±0.02	2.95±0.00	280.0±0.20	0.56±0.02	99.75±0.38

Table 3. In vitro release data of Naratriptan mucoadhesive tablets (F1, F2 & F3)

Time (h)	F-1	F-2	F-3
0.5	33.91±0.25	25.46±0.54	17.89±0.91
1	55.97±1.56	35.56±1.19	22.28±0.27
2	88.24±0.74	48.51±0.49	29.96±0.47
3	101.52±0.58	60.03±1.21	46.20±0.21
4	--	71.23±1.77	50.15±0.65
5	--	86.59±0.62	59.59±0.25
6	--	94.82±1.17	68.59±1.54
7	--	102.95±1.54	76.28±0.53
8	--	--	88.24±0.11

Table 4. Invitro release data of Naratriptan mucoadhesive tablets containing HPMC K100 (F4, F5 & F6)

Time (h)	F-4	F-5	F-6
0.5	24.69±0.35	19.86±0.99	17.11±0.08
1	39.73±1.35	27.32±0.25	23.14±1.18
2	48.95±2.36	36.98±1.77	33.20±1.13
3	60.47±2.02	48.40±1.31	43.60±1.10
4	70.35±2.65	57.40±1.95	51.06±0.21
5	82.42±1.95	65.19±0.79	56.02±0.47
6	97.79±0.34	70.46±1.34	60.64±1.65
7	------	78.25±0.38	74.24±1.09
8	------	87.25±0.79	77.75±0.38
9	------	97.62±1.95	83.41±1.31

Table 5. Invitro release data of Naratriptan containing Carbopol 934 (F7, F8 & F9)

Time (h)	F-7	F-8	F-9
0.5	50.04±0.26	35.56±0.32	21.84±0.44
1	65.63±0.29	40.17±0.18	29.19±0.38
2	68.92±0.72	54.00±0.16	44.02±0.24
3	82.20±2.38	65.96±2.22	58.51±1.59
4	98.89±3.45	74.74±0.33	68.37±0.55

5	------	82.75±0.18	78.36±0.48
6	------	99.43±1.98	87.03±0.82
7	------	------	96.32±1.98

Table 6. Regression analysis of the in vitro release data according to various release Kinetic models

Formulation code	Zero order	First order	Higuchi	Korsmeyer-Peppas
	r2	r2	r2	r2
F5	0.960	0.935	0.993	0.926

Fig 1. Invitro dissolution graph of formulations F1-F3

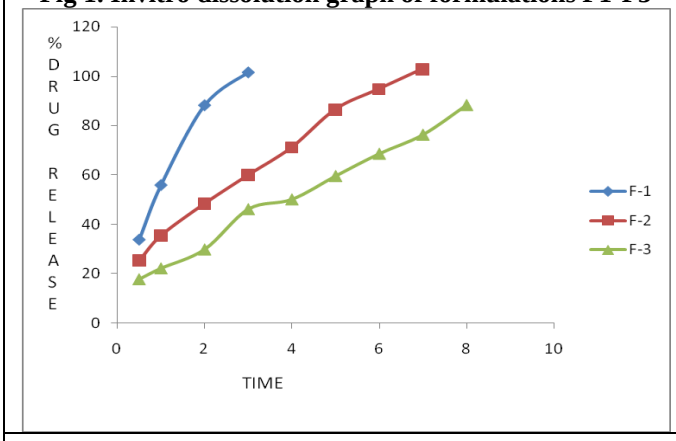


Fig 2. Invitro dissolution graph of formulations F4-F6

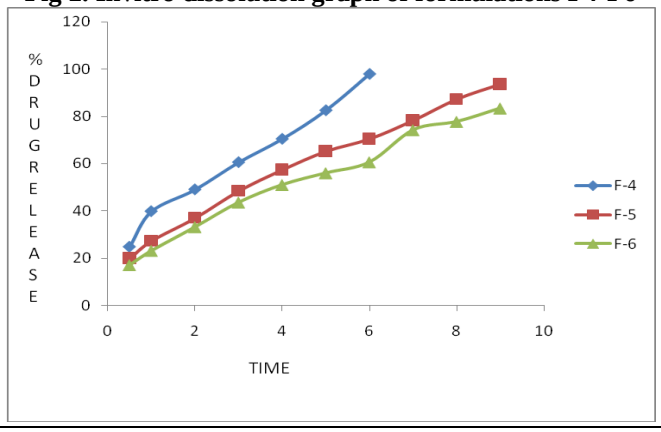


Fig 3. InVitro dissolution graphs of formulation (F7, F8 & F9)

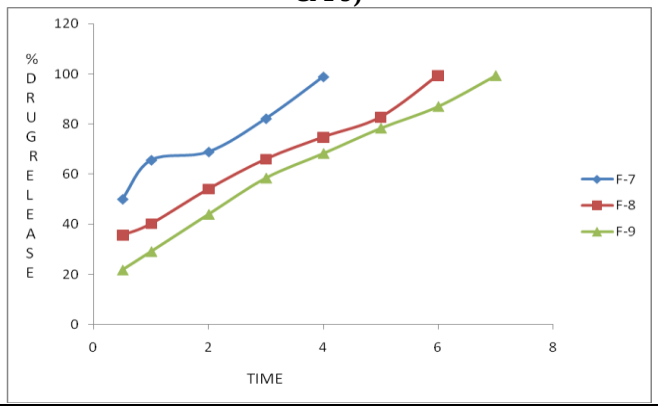


Fig 4. Zero order release kinetics graph for F5 formulation

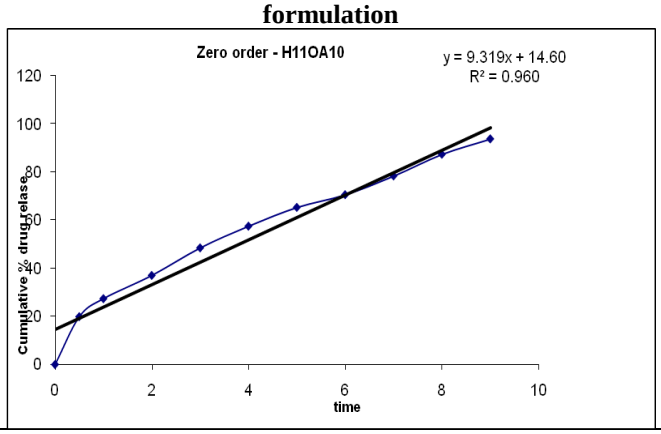


Fig 5. First order release kinetics graph for F5 formulation

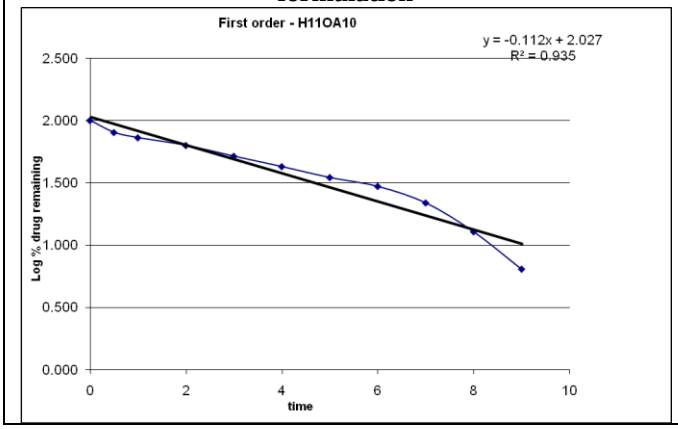


Fig 6. Higuchi release kinetics graph for F5 formulation

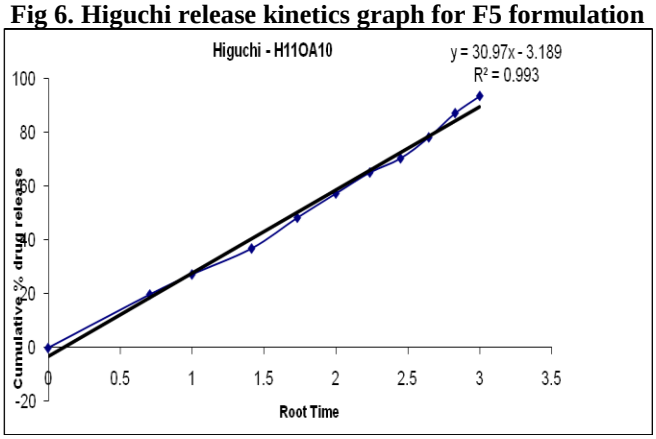
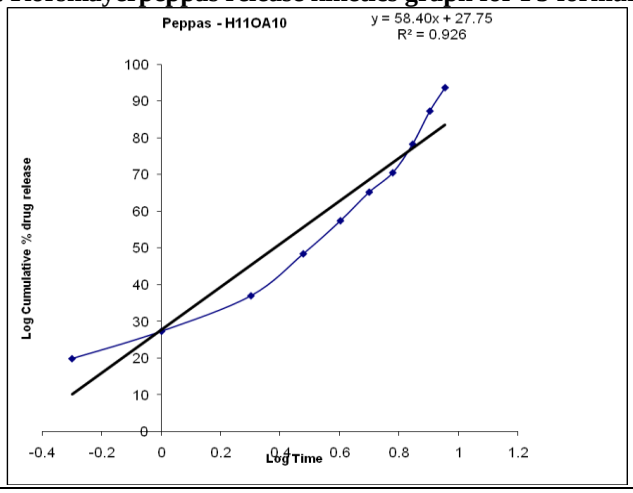


Fig 7. Korsmayerpeppas release kinetics graph for F5 formulation



CONCLUSION

From the foregoing investigation it may be conclude that the release rate of drug from the buccal tablets can be governed by the polymer and concentration of the polymer employed in the preparation of tablets. Regulated drug release in first order manner attained in the current study indicates that the hydrophilic matrix tablets of Naratriptan was prepared using Carbopol 934 and HPMC K100 can successfully be employed as a buccoadhesive controlled released during delivery system. The precompression blends for all formulations were subjected to various evaluation parameters and the results were found to be within limits. The post compression parameters for all the formulations also found to be within limits. Slow, controlled and complete release of Naratriptan over a period of 9 hours was obtained from matrix tablets formulated employing HPMC K 100 (F5 Formulation) with 97.62 % drug release.

ACKNOWLEDGEMENT

Nil

CONFLICT OF INTEREST

Authors declare no conflict of interest.

REFERENCES

Borgaonkar PA, Virsen TG, Hariprasanna RC and Najmuddin M. Formulation And In Vitro Evaluation Of Buccal Tablets Of Loratadine For Effective Treatment Of Allergy. *International Journal Of Research In Pharmacy And Chemistry*, 1(3), 2011, 23.

Guda A, Ganesh KG, Manasa B, Subal D, Rajesham VV. Design and Evaluation Of Controlled Release Mucoadhesive Buccal Tablets Of Lisinopril. *International Journal of Current Pharmaceutical Research*, 2(4), 2010, 34.

Iman SJ and Nidhal K. Maraie Formulation and In vitro Evaluation of Buccal Mucoadhesive Tablets of Promethazine HCl. *Int. J. Pharm. Sci. Rev. Res.*, 24(1), 2014, 61-69.

Mahalaxmi D, Senthil A, Prasad V. Formulation and Evaluation Of Mucoadhesive Buccal Tablets Of Glipizide. *International Journal of Biopharmaceutics*, 1(2), 2010, 100-107.

Muthukumaran M, Dhachinamoorthi D, Chandra Sekhar KB. Development and optimization of hydralazine HCl sustained release mucoadhesive buccal tablets using 23factorial design. *Int J Adv Pharm Gen Res*, 1(2), 2013, 20-32.

Naga RK, Velmurugan S, Deepika B, Sundar V. Formulation and Invitro Evaluation Of Buccal Tablets Of Metoprolol Tartrate. *International Journal of Pharmacy and Pharmaceutical Sciences*,3(4), 2011, 45.

Pethe M and Salunkhe SP. Formulation And Evaluation Of Mucoadhesive Buccal Tablet Of Simvastatin. *Int J Pharm Bio Sci*, 5(3), 2014, 268 – 278.

Sachin SD, Khadabadi SS, Shahi SR. Formulation and Evaluation of Bilayer Buccal Tablet Of Sumatriptan Succinate. *International Journal of Pharmacy and Pharmaceutical Sciences*, 6(6), 2014, 0975-1491.

Satyabrata B, Ellaiah P, Sujit K M, Pratit KS, Sandip P, et al. Formulation and in vitro evaluation of mucoadhesive buccal tablets of Timolol maleate. *Int J Pharm Biomed Res*, 1(4), 2010, 129-134.

Sellappan V and Srinivas P. Formulation And In Vitro Evaluation of Losartan Potassium Mucoadhesive Buccal Tablets. *Asian J Pharm Clin Res*, 6(3), 2013, 125-130.

Shabaraya AR, Aiswarya K and Mohd A. Evaluation of buccal tablet. *International Journal of Advances In Pharmacy*, 1(3), 2012, 2277 – 4688.

Sudhakar B and Mohideen S. Formulation And In-Vitro Evaluation Of Mucoadhesive Dosage Form Containing LevosalbutamolSulphate. *World Journal Of Pharmacy And Pharmaceutical Sciences*, 4(1), 2011, 1093-1112.

Suresh KP, Srikanth B, Satyanarayana T, Shaji G, Navaneetha KS, Saranya P. Formulation And Evaluation Of Nebivolol Mucoadhesive Buccal Tablet. *Pharmacologyonline*, 3, 2011, 869-885.

Swapnil RC and Amol AH. Design And In- Vitro Evaluation Of Mucoadhesive Buccal Tablets Of Carvedilol. *International Journal of PharmTech Research*, 4(2), 2012, 1827-1833.

Vaidya VM, Manwar JV, Mahajan NM and Sakarkar DM. Design and In- Vitro Evaluation of Mucoadhesive Buccal Tablets of Terbutaline Sulphate. *International Journal of PharmTech Research*, 1(3), 2009, 588-597.

Vaishali AC, Suraj MS, Bhushankumar SS, Gautam DP. Vadnere Formulation And Evaluation Of Mucoadhesive Buccal Tablet Of Flurbiprofen. *World Journal Of Pharmacy And Pharmaceutical Sciences*, 3(5), 2013, 945-962.

Velmurugan S, Deepika B, Nagaraju K, SundarV. Formulation and in-vitro Evaluation of Buccal Tablets of Piroxicam. *International Journal of PharmTech Research*, 2(3), 2010, 1958-1968.

Cite this article:
Gollapudi Rajesh, PaladuguSujitha, MD.Parveen, B.Indraja. Design and *In Vitro* Characterization of Naratriptan Buccoadhesive Tablets for the Treatment of Migraine. *International Journal of Pharmacy & Therapeutics*, 8(4), 2017,170-175.
DOI: http://dx.doi.org/10.21276/ijpt.2017.8.4.7