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DESIGN AND INVITRO CHARACTERIZATION OF BUSPIRONE TABLETS FOR BUCCAL DRUG DELIVERY SYSTEMS

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ABSTRACT

In the current study Regulated drug release in first order manner attained indicates that the hydrophilic matrix tablets of Buspirone was prepared using Carbopol 934 and HPMC K100 can successfully be employed as a buccoadhesive controlled released during delivery system. The precompression blend foe 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 Buspirone over a period of 9 hours was obtained from matrix tablets formulated employing HPMC K 100 (F5 Formualtion) with 98.67% drug release.

KEYWORDS: Buspirone, buccoadhesive.

1. 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 urogential tract, the airways, the ear, nose and eye. These represent potential sites for attachment of any mucoadhesive system and hence, the mucoadhesive drug delivery system may includes.

Buccal delivery system Ocular delivery system
Vaginal delivery syste Rectal delivery system
Gastrointestinal delivery system Nasal delivery system

Buccoadhesive drug delivery

The potential route of buccal mucosal route of drug administration was first recognized by Walton and others reported in detail on the kinetics of buccal mucosal absorption. Buccoadhesion, or the attachment of a natural or synthetic polymer to a biological substrate, is a practical method of drug immobilization or localization and an important new aspect of controlled drug delivery. The unique environment of the oral (buccal) cavity offers its potential as a site for drug delivery. Because of the rich blood supply and direct access to systemic circulation. The Buccal route is suitable for drugs, which are susceptible to acid hydrolysis in the stomach or which are extensively metabolized in the liver (first pass effect).

Buccal route of administration: The medicament is placed between the cheek and the gum. The barrier to drug absorption from this route is the epithelium of oral mucosa. Passive diffusion is the major mechanism for absorption of drugs. Drugs with short biological half-lives, requiring a sustained effect, poor permeability, sensitivity to enzymatic degradation and poor solubility may be successfully delivered via bioadhesive buccal delivery systems.

Advantages of Buccal route: Rapid absorption and higher blood levels due to high vascularization of the region and therefore particularly useful for administration of antianginal drugs.

1. No first-pass hepatic metabolism.
2. No degradation of drugs such as that encountered in the GIT.
3. Presence of saliva facilitates both drug dissolution and its subsequent permeation by keeping the oral mucosa moist.
4. It is a safer method of drug administration, since drug absorption can be promptly terminated in cases of toxicity by removing the dosage form from the buccal cavity.

Disadvantages of buccal route

1. Accidental swallowing of the formulation by the patient.

2. Difficulty in speaking and drinking.

Limitations

1. Only limited amount of drug can be used in these systems (25-50 mg).
2. Drug must be non-irritant to the buccal mucosa.

Mechanism of bioadhesion

Adhesion between a polymer and a tissue is primarily due to three types of interactions.

Physical or Mechanical bond: is formed when the polymer material is deposited on and include in the crevices of the tissue. This inclusion is necessary for the establishment intimate contact between the polymer and tissue, which is critical to the occurrence of a good bioadhesive bond.

Secondary chemical bonds: including hydrogen bonding and Vander Waals forces can contribute to bioadhesion some functional groups that forms hydrogen bonds contributing to adhesion include hydroxyl, carboxyl, sulfate and amino groups on both the bioadhesive material and on the glycoprotein of the mucus.

Primary bonds: are formed by chemically reacting the polymer and the substrate. This type of bonding is only desirable when the connection between the substrate and adhesive is to be permanent, such as in dental or orthopedic applications.

Bioadhesive polymers

1. Hydrophilic polymers that are water soluble
2. Water insoluble polymers that are swellable networks joined by cross-linking agents

- Anionic group: Carbopol, Polyacrylates and their cross linked modifications.
- Cationic group: Chitosan and its derivatives
- Neutral group: Eudragit-NE30D etc.

Mechanism of Action

Buspirone is an anxiolytic agent and a serotonin receptor agonist belonging to the azaspirodecanedione class of compounds. Its structure is unrelated to those of the benzodiazepines, but it has an efficacy comparable to diazepam.

MATERIALS AND METHODS

Buspirone from the Natco LABS. Microcrystalline cellulose Signet Chemical Corporation, Mumbai, India. Magnesium stearate TALC Hydroxy propyl methyl cellulose Ethyl Cellulose Carbomer 934P Merck Specialities Pvt Ltd, Mumbai, India.

Method of Preparation of mucoadhesive tablets

Preparation: Direct compression method has been employed to prepare buccal tablets of Buspirone using HPMC K15, HPMC K100, and CARBOPOL 934 as polymers.

Procedure: All thae ingredients including drug, polymer and excipients were weighed accurately according to the batch formula (Table-6.1). All the ingredients except lubricants were mixed in the order of ascending weights and blended for 10 min in an inflated polyethylene pouch. After uniform mixing of ingredients, lubricant was added and again mixed for 2 min. The prepared blend (230 mg) of each formulation was pre-compressed, on multi stationed tablet punching machine at a pressure of 0.5 ton for 30 s to form single layered flat-faced tablet of 9 mm diameter. Then, 50 mg of ethyl cellulose powder was added and final compression was done at a pressure of 3.5 tons for 30 s to get bilayer tablet. Compositions of the designed bilayer tablets are given.

INGREDIENTS	F1	F2	F3	F4	F5	F6	F7	F8	F9
BUSPIRONE	30	30	30	30	30	30	30	30	30
HPMC K15	20	30	40	----	----	----	----	----	----
HPMC K100	----	----	----	20	30	40	----	----	----
CARBOPOL 934	----	----	----	----	----	----	20	30	40
Talc	3	3	3	3	3	3	3	3	3
Magnesium stearate	3	3	3	3	3	3	3	3	3
MCC pH 102	QS	QS	QS	QS	QS	QS	QS	QS	QS
ETHYL CELLULOSE	50	50	50	50	50	50	50	50	50
TOTAL	250	250	250	250	250	250	250	250	250

RESULTS AND DISCUSSION

Standard calibration graph of Buspirone

Concentration (mcg/ml)	Absorbance* (mean±SD)
2	0.08
4	0.158
6	0.237
8	0.318
10	0.397
12	0.485

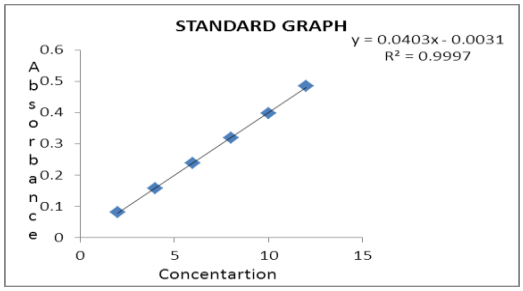


Fig No: 7. 1 Calibration curve of Buspirone.

Drug-excipient compatibility studies, 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

Evaluation Data of Buspirone Buccoadhesive tablets

Formulation code	Hardne2ss (kg/cm)	Thickness (mm)	Weight variation (mg)	Friability (%)	Drug content (%)
F1	4.8±0.02	2.80±0.00	249.6±0.99	0.79±0.01	100.09±0.56
F2	4.3±0.05	2.83±0.06	248.8±0.99	0.67±0.01	102.73±0.46
F3	4.3±0.05	2.87±0.06	249.8±0.38	0.57±0.01	98.75±0.88
F4	5.7±0.06	2.86±0.06	250.7±0.99	0.55±0.00	99.70±0.34
F5	5.4±0.03	2.87±0.06	249.8±0.38	0.51±0.01	97.95±0.38
F6	5.0±0.02	2.90±0.00	250.1±0.99	0.87±0.03	98.75±0.88
F7	5.6±0.07	2.97±0.06	249.6±0.17	0.46±0.01	103.36±0.83
F8	5.3±0.05	3.01±0.01	251.0±0.40	0.72±0.01	101.09±4.00
F9	5.1±0.02	2.95±0.00	250.0±0.20	0.56±0.02	99.75±0.38

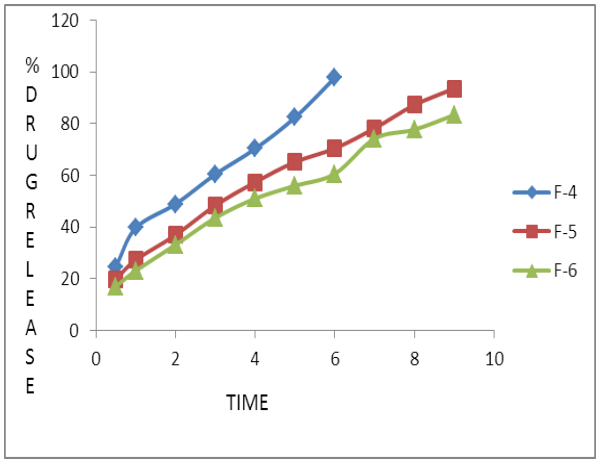
In-Vitro Drug Release Studies.

Table -7.4. In vitro release data of Buspirone mucoadhesive tablets (F1, F2 & F3).

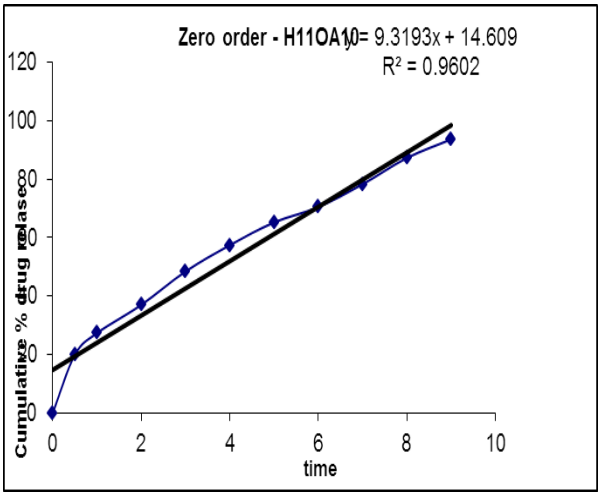
Time (h)	F-1	F-2	F-3	F-4	F-5	F-6
0.5	33.91±0.25	25.46±0.54	17.89±0.91	24.69±0.35	19.86±0.99	17.11±0.08
1	55.97±1.56	35.56±1.19	22.28±0.27	39.73±1.35	27.32±0.25	23.14±1.18
2	88.24±0.74	48.51±0.49	29.96±0.47	48.95±2.36	36.98±1.77	33.20±1.13
3	101.52±0.58	60.03±1.21	46.20±0.21	60.47±2.02	48.40±1.31	43.60±1.10
4		71.23±1.77	50.15±0.65	70.35±2.65	57.40±1.95	51.06±0.21
5		86.59±0.62	59.59±0.25	82.42±1.95	65.19±0.79	56.02±0.47
6		94.82±1.17	68.59±1.54	97.79±0.34	70.46±1.34	60.64±1.65
7		102.95±1.54	76.28±0.53	------	78.25±0.38	74.24±1.09
8		---------	88.24±0.11	------	87.25±0.79	77.75±0.38
				------	98.67±1.95	83.41±1.31

In vitro release data of Buspirone containing Carbopol 934 (F7, F8 & F9)

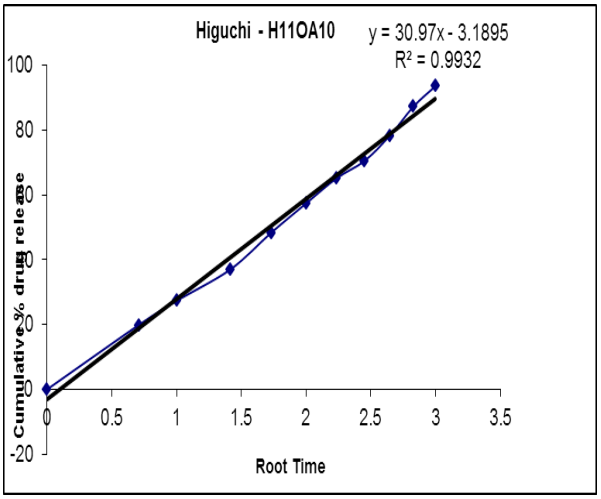
Time (h)	F-7	F-8	F-9
0.5	50.04±0.26	35.56±0.32	21.84±0.44
1	65.63±0.29	40.17±0.18	29.19±0.38
2	68.92±0.72	54.00±0.16	44.02±0.24
3	82.20±2.38	65.96±2.22	58.51±1.59
4	98.89±3.45	74.74±0.33	68.37±0.55
5	------	82.75±0.18	78.36±0.48
6	------	99.43±1.98	87.03±0.82
7	------	------	96.32±1.98



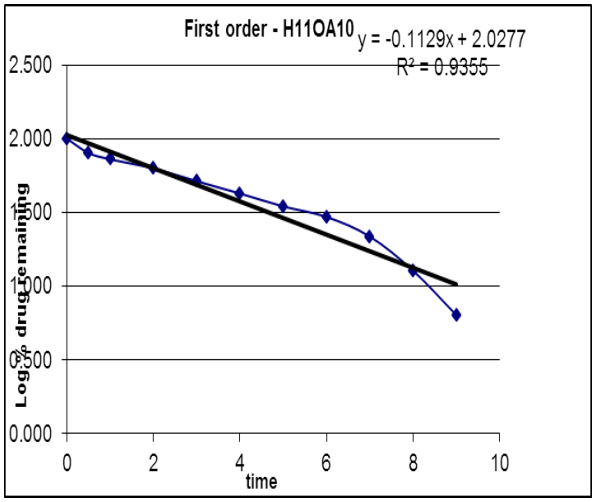
Invitro dissolution graph of formulations F4-F6



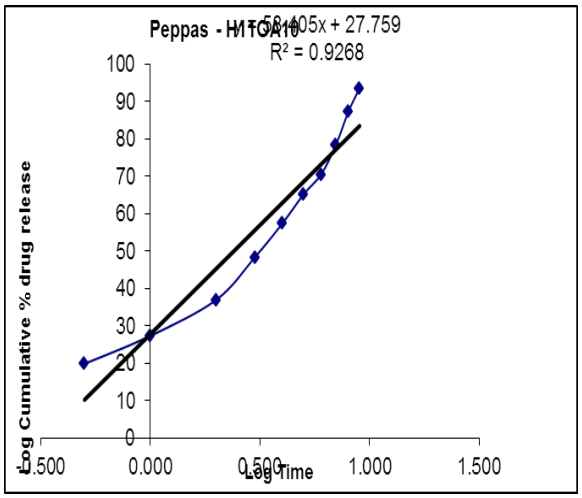
Zero order release kinetics graph for F5 formulation.



Higuchi release kinetics graph for F5 formulation.



First order release kinetics graph for F5 formulation.



Korsmayer peppas release kinetics graph for F5 formulation.

Regressional analysis of the in vitro release data according to various release kinetic models.

Formulation code	Ze ro order	First order	Higuchi	Korsmeyer-Peppas
	r^2	r^2	r^2	r^2
F5	0.960	0.935	0.993	0.926

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 Buspirone was prepared using Carbopol 934 and HPMC K100 can successfully be employed as a buccoadhesive controlled released during delivery system.

The precompression blend foe all formulations were subjected to various evaluation parameters and the results were found to be within limits.

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REFERENCES

1. Ram S. Pentewar, Dr. Sanjay S. Thonte, Rohit U. Bharti, R. V. Sugave, V. Garud.
2. Formulation And In-Vitro Evaluation Of Mucoadhesive Dosage Form Containing Levosalbutamol Sulphate World Journal Of Pharmacy And Pharmaceutical Sciences, 4(1): 1093-1112.
3. Vaishali A. Chaudhari, Dr. Suraj M.Sarode, Prof. Bhushankumar S. Sathe, Dr. Gautam P.Vadnere Formulation And Evaluation Of Mucoadhesive Buccal Tablet Of Flurbiprofen World Journal Of Pharmacy And Pharmaceutical Sciences, 3(5): 945-962
4. Iman S. Jaffar, Nidhal K. Maraie Formulation and In vitro Evaluation of Buccal Mucoadhesive Tablets of Promethazine HCl Int. J. Pharm. Sci. Rev. Res, Jan – Feb 2014; n 12, 24(1): 61-69.
5. Sachin S. Darekar, S.S. Khadabadi1, S.R. Shahi Formulation And Evaluation Of Bilayer Buccal Tablet Of Sumatriptan Succinate International Journal of Pharmacy and Pharmaceutical Sciences, 2014; 6(6): 0975-1491.
6. M. Pethe And S. P. Salunkhe Formulation And Evaluation Of Mucoadhesive Buccal Tablet Of Simvastatin Int J Pharm Bio Sci, 2014 July; 5(3): (P) 268-278.
7. Muthukumaran. M, Dhachinamoorthi. D, Chandra Sekhar. K.B Development and optimization of hydralazine HCl sustained release mucoadhesive buccal tablets using 23factorial design Int J Adv Pharm Gen Res, 2013; 1(2), 20-32. ISSN 2347-5102.
8. Ab. Sudheer*, Av. Saikishore, Am. Sandeep, Ak. Srikanth, Bm. Teja Krishna Design And Development Of Mucoadhesive Buccal Tablets Of Metoprolol Succinate By Using Moringa Oleifera Gum.
9. An International Journal of Advances in Pharmaceutical Sciences, November-December 2013; 4(6): 1186-1196.
10. Sellappan Velmurugan *, P.Srinivas Formulation And In Vitro Evaluation Of Losartan Potassium Mucoadhesive Buccal Tablets Asian J Pharm Clin Res, 2013; 6(3): 125-130.
11. Swapnil R.Chaudhari, Amol A.Harsulkar Design And In- Vitro Evaluation Of Mucoadhesive Buccal Tablets Of Carvedilol International Journal of Pharm Tech Research, Oct-Dec 2012; 4(4): 1827-1833.