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FORMULATION AND EVALUATION OF MUCOADHESIVE BILAYER BUCCAL TABLETS OF SALBUTAMOL SULPHATE

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ABSTRACT

The objective of the present study was to design and evaluation of mucoadhesive bilayer buccal tablets salbutamol sulphate. since the drug has only 40% oral bioavailability, an attempt was made to develop mucoadhesive buccal tablets of salbutamol sulphate that could be applied to the buccal mucosa to release the drug unidirectionally in buccal cavity in order to decrease gastric irritation and avoid first pass effect for improvement in bioavailability to reduce the dose dumping frequency and to improve patient compliance. Salbutamol sulphate (SS) is a selective â2-adrenergic agonist which acts on â2-adrenoreceptor for the treatment of bronchospasm in conditions such as asthma and COPD. Formulation of tablet using various polymers for buccal delivery. Ethyl cellulose and magnesium stearate added to act as an impermeable backing layer which gives unidirectional buccal drug delivery.

KEYWORDS: Mucoadhesive Bilayer Buccal Tablets, Salbutamol Sulphate, COPD, FT-IR, HPMC 3cps, HPMC 5cps, HPMC K4M, HPMC K15M, Mannitol, Carbopol 940 and Ethyl Cellulose.

1. INTRUDUCTION

1.1. BUCCCAL DRUG DELIVERY SYSTEM

Buccal delivery of drugs provides an attractive alternative to the oral route of drug administration, particularly in overcoming deficiencies associated with the latter mode of administration problems such as high first pass metabolism, drug degradation in harsh gastro

intestinal environment can be circumvented by administering a drug via buccal route1,2&3. More over buccal drug absorption can be terminated promptly in case of toxicity by removing the dosage form from the buccal cavity (Shojaei HA *et al* 1998). It is also possible to administer the drug to patients who cannot be dosed orally to prevent accidental swallowing. Buccal delivery refers to drug release which can occur when a dosage form is placed in the outer vestibule between the buccal mucosa and gingiva.

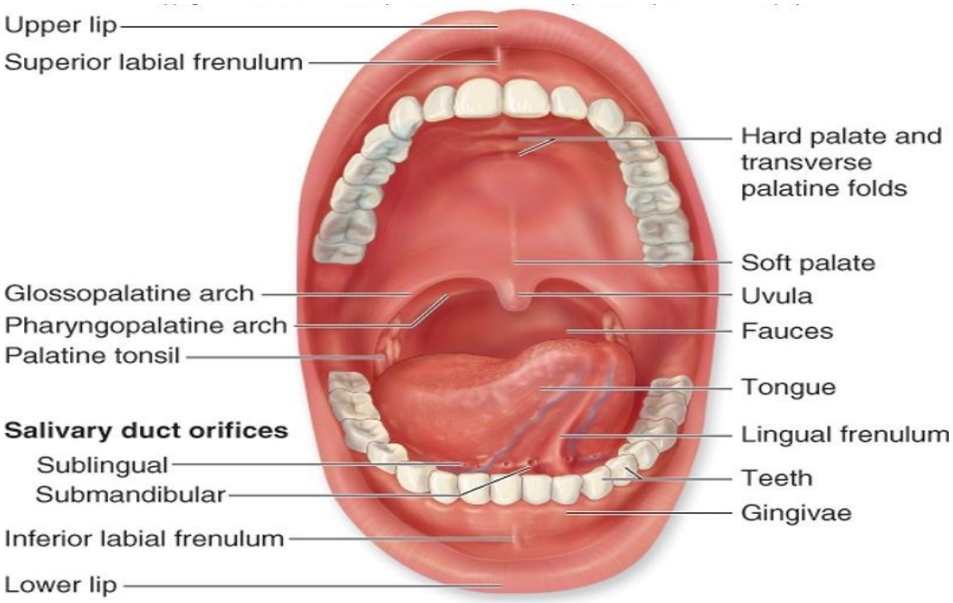

Fig-no-1: Structure of buccal cavity

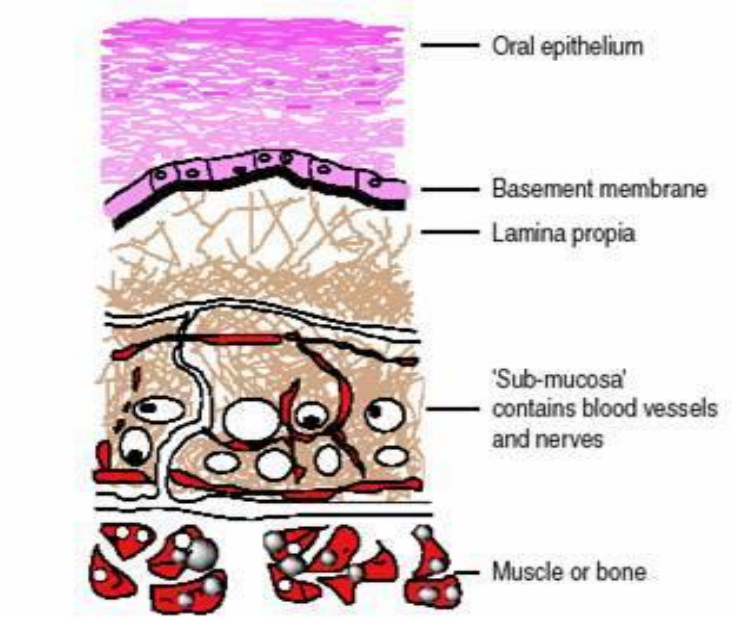

Fig-no-2: Structure of buccal mucosa.

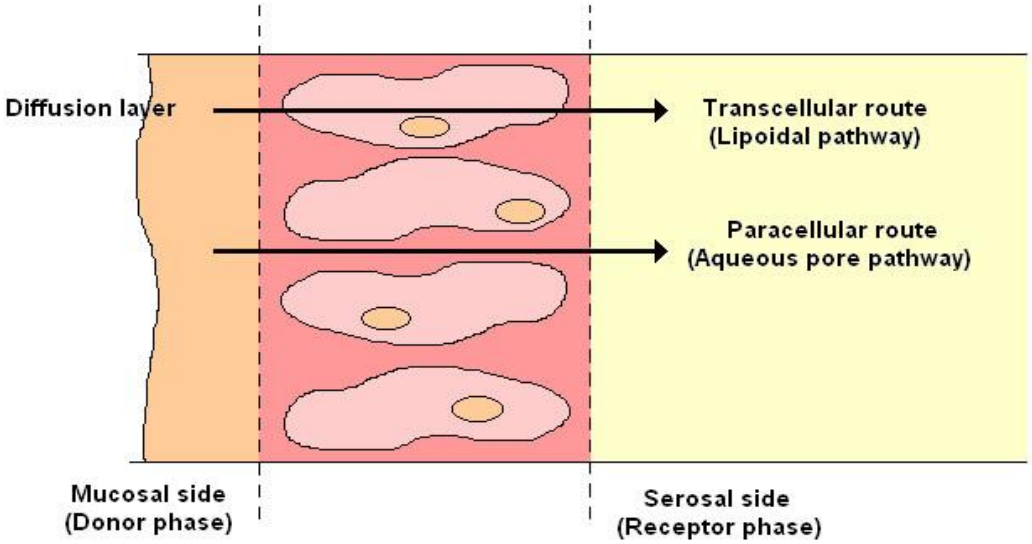

Fig-no-3: Drug absorption pathways across buccal mucosa

1.2. TYPES OF BUCCAL DRUG DELIVERY SYSTEM

For delivery of drug through buccal region several mucoadhesive dosage forms have been reported because of the presence of a smooth and relatively immobile surface for placement of a mucoadhesive dosage forms the buccal region appears to be more suitable for sustained delivery of therapeutic agents using a mucoadhesive system. The various types of buccal drug delivery system are explained as follows (Miller NS *et al* 2005)

a) Buccal patches/films

b) Buccal gels and ointments

c) Buccal tablets

1.3. ADVANCES IN BUCCAL DRUG DELIVERY DOSAGE FORMS

Buccal mucoadhesive dosage forms can be categorized into three types based on their geometry.

Type I

It is a single layer device with multidirectional drug release. This type of dosage form suffers from significant drug loss due to swallowing.

Type II

It is a device in which an impermeable backing layer is superimposed on top of the drug loaded bioadhesive layer creating a double- layered device and preventing drug loss from the top surface into the oral cavity.

Type III

It is a unidirectional drug release device, from which drug loss is minimal, since the drug is released only from the side adjacent to the buccal mucosa. This can be achieved by coating every face of the dosage form, except the one that is in contact with the buccal mucosa.

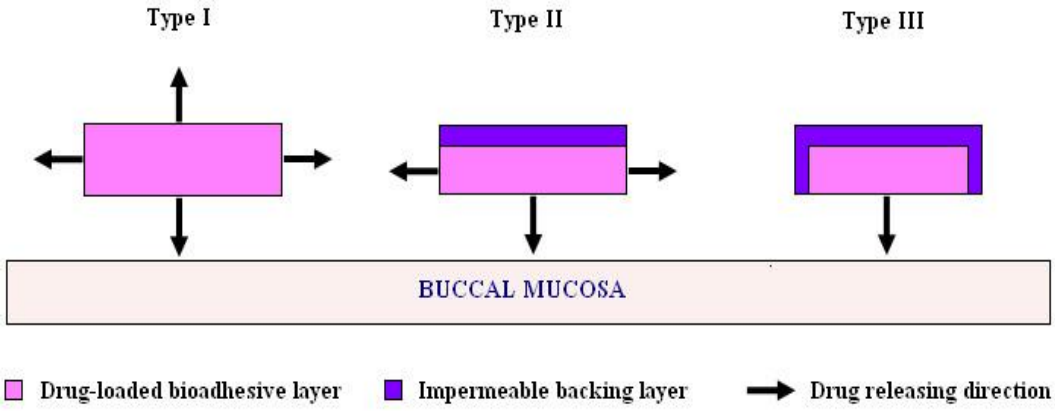

Fig-no-4: Design of buccal mucoadhesive dosage forms

2. MATERIALS AND METHODS USED

2.1. MATERIALS USED

Salbutamol Sulphate, HPMC 3cps, HPMC 5cps, HPMC K4M, HPMC K15M, Mannitol, Carbopol 940, Magnesium stearate, Talc, Ethyl cellulose, Sodium hydroxide, Potassium di hydrogen phosphate.

2.2. METHODS USED

2.2.1. Manufacturing flow chart for Bilayer Buccal Tablets Salbutamol Sulphate

1. Salbutamol sulphate+ Mucoadhesive polymers (#60 → Mixing in polybag

2. Step1materil + Carbopol(#60) +Mannitol(#30) → Mixing in polybag

3. Step2 material+Talc(#60)

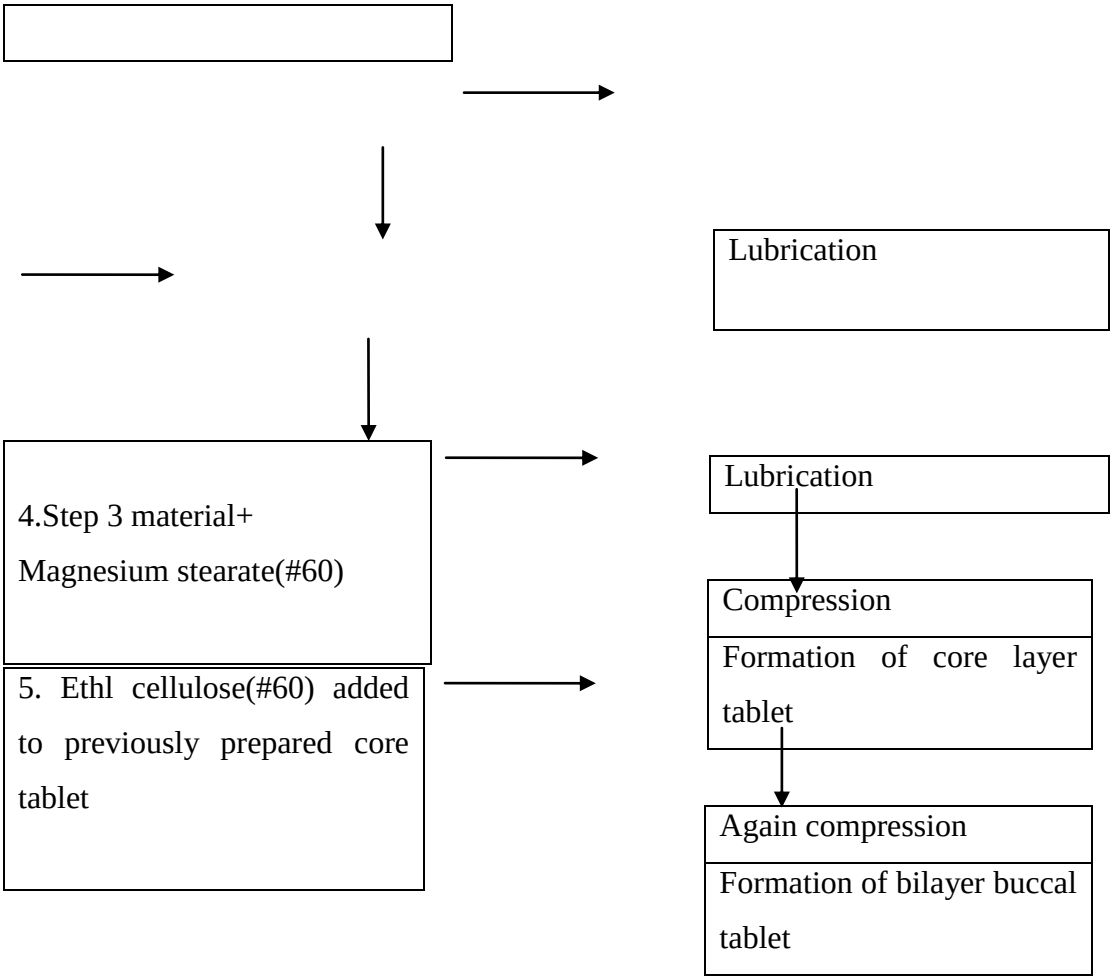

Fig- no-5: Manufacturing flow chart for Bilayer Buccal Tablets.

2.2.2. EVALUATION OF PRECOPMPRESSIONAL PROPERTIES

Angle of repose

The angle of repose of API powder was determined by funnel method. Angle of Repose is defined as the maximum angle possible between the surface of a pile of the powder and the horizontal plane. The accurately weighed powder blend was taken in the funnel. The height of the funnel was adjusted in a way that, it measures 2.5 cm from the surface level. The powder blend is allowed to flow through the funnel freely on to the surface (David Haris *et al* 1992). The diameter of the powder cone is measured and the same procedure is done for triplicate, the average value is taken. The angle of repose is calculated by using equation. Results were shown in Table.no:12

Angle of Repose (θ) =Tan $^{-1}$ (h/r)

Where, h = height of pile

r = radius of the base of the pile

θ = angle of repose

Table no: 1: Angle of repose and corresponding flow properties

Angle of Repose	Flow property
<25	Excellent
25-30	Good
30-40	Passable
>40	Very poor

Bulk density determination

Accurately weighed 5 g of drug (M), which was previously passed through 20 # sieve, was transferred in 50 ml graduated cylinder. The powder in the cylinder was leveled without compacting, and the unsettled apparent volume (V_0) was noted. The apparent bulk density (gm/ml) was calculated by the following formula. Results were shown in Table.no: 12.

Bulk density (BD) = W/V_0 gm/ml

W=Weight of the powder

V_O=Volume of powder

Tapped density determination

Accurately weighed 5g of drug, which was previously passed through 20 # sieve, was transferred in 50 ml graduated cylinder. Then the cylinder containing the sample was mechanically tapped by raising the cylinder and allowing it to drop under its own weight using mechanically tapped density tester that provides a fixed drop of 14± 2 mm at a nominal rate of 300 drops per minute. The cylinder was tapped 500 times initially and the tapped volume (V1) was measured to the nearest graduated units, the tapping was repeated an additional 750 times and the tapped volume (V2) was measured to the nearest graduated units. If the difference between two volumes is less than 2% then the final volume V_f is considered as a tapped volume. The tapped bulk density in gm/ml was calculated by the following formula. Results were shown in Table.no: 12.

Tapped density (TD) = W/ V_f gm/ml

W=Weight of the powder

V_f= Tapped volume of powder

Carr's index

Carr's index is also known as compressibility. It is indirectly related to the relative flow rate, cohesiveness and particle size. It is simple, fast and popular method of predicting powder flow characteristics. Results were shown in Table.no:12

Table no: 2: Carr's index and corresponding flow properties

Carr's Index (%)	Flow
5-15	Excellent
16-18	Good
18-21	Fair to passable
23-35	Poor
33-38	Very poor
>40	Very very poor

Carr's index was calculated by using the formula

$$\text{Carr's Index} = \frac{(\text{Tapped Density} - \text{Bulk Density}) \times 100}{\text{Tapped Density}}$$

Hausner's ratio

Hausner's ratio indicates the flow properties of the powder and measured by the ratio of tapped density to bulk density. The relationship between Hauser's ratio and flow property.Hausner's ratio was calculated by using the formula. Results were shown in Table.no:12

Hausner's Ratio = Tapped density / Bulk density

Table no: 3: Hausner's ratio and corresponding flow properties

Hausner's Ratio	Property
0-1.2	Free flowing
1.2-1.6	Cohesive Powder

2.2.3. DRUG- EXCIPIENT COMPATIBILITY STUDY

The compatibility of drug and formulation components is important prerequisite for formulation development. It is therefore necessary to confirm that the drug does not interact with excipients under experimental conditions and affect the shelf life of product or any other unwanted effects on the formulation. Compatibility studies conducted to investigate and predict physico chemical interaction between drug substance and excipients and therefore to select suitability of chemically compatible excipients.

Compatibility studies were performed by preparing compatibility blends at different ratios of different excipients with drug based on tentative average weight. These blends were stored at

accelerated conditions at 40^0c, 75%RH for one month. The samples were kept in double lined poly bags and the samples were evaluated for any change in physical characteristics. Samples were evaluated for any change in physical characteristics with reference to controlled sample stored at 4^oc for 30 days. Taken out at two weeks interval and were subjected to physical and chemical testing and results were noted.

Chemical compatibility is tested by FTIR spectrometry, which is most powerful technique to identify functional groups of the drug.

2.2.4. EVALUATION OF POST COMPRESSIONAL PARAMETERS

Thickness

The thickness of the tablets was determined by using Digital screw gauge. Ten individual tablets from each batch were used and the results averaged. The results were expressed in mm (Chatterjee CC *et al* 2004).

Weight variation

Twenty tablets were randomly selected from each batch and individually weighed. The average weight and standard deviation were calculated. The test for weight variation is passed only if not more than two of the individual tablet weights deviate from the average weight by more than the allowed percentage deviation and none deviate by more than twice the percentage shown. Results were shown in table no: 13

Table no: 4: Weight variation requirements as per USP

Average weight	% Difference
130mg or less	10
More than 130mg through 324mg	7.5
More than 324mg	5

Friability

The friability values of the tablets were determined using a Roche friabilator. It is expressed in %.20 tablets were initially weighed (initial weight) and transferred to friabilator. Friabilator was operated at 25 rpm for 4 min. Percentage friability was calculated using the following equation.

$$\%\text{Friability} = \frac{\text{Initial wt - final wt}}{} \times 100$$

Hardness test

The crushing strength (kg/cm2) of tablets was determined by using Monsanto hardness tester.

Drug Content Uniformity Test

For determination of drug content three tablets from each formulation were weighed individually, crushed and diluted to 100ml with sufficient amount of PH 7.4. Then aliquot of the filtrate was diluted suitably and analyzed spectrophotometrically at 223 nm against blank.

Surface pH

For the determination of surface pH of the buccal tablets, a combined glass electrode is used. The tablet is allowed to swell by keeping it in contact with 1 ml of distilled water (pH 6.8±0.05) for 2 h at room temperature. The pH is identified by bringing the electrode into contact with the tablet surface and allowing to equilibrating for 1 min.

Swelling index

The swelling index of the buccal tablet was evaluated by using pH 7.4 phosphate buffer. The initial weight of the tablet is determined (w1). The tablet was placed in pH 7.4 phosphate buffer (6 ml) in a petri-dish placed in an incubator at 37 ± 1^{0}C and tablet was removed at different time intervals (0.5, 1.0 to 12 h), and reweighed (w2). The swelling index was calculated using the formula. Swelling index = 100 $(w_2-w_1)/w_1$.

***In- Vitro* Drug Release of Buccal Tablets** (Brahmaiah Bonthagarala *et al* 2013)

The drug release rate from buccal tablets was studied using the USP type II dissolution test apparatus. The dissolution medium consisted of 900 ml of phosphate buffer pH 7.4. The release was performed at 37 ±0.5°C , with a rotation speed of 50 rpm. The backing layer of buccal tablet was attached to the glass slide with instant adhesive (cyanoacrylate adhesive). The slide was placed in to the bottom of the dissolution vessel. Samples (5 ml) were withdrawn at 0, 1, 2, 4, 8, 10, 12hr time intervals and replaced with fresh medium. The samples were filtered through filter paper and analyzed by UV spectrophotometer at 223 nm.

Drug Release Kinetics (Brahmaiah Bonthagarala *et al* 2013)

The mathematical models are used to evaluate the kinetics and mechanism of drug release from the tablets. The model that best fits the release data is selected based on the correlation coefficient (r) value in various models. The model that gives high ‘r’ value is considered as the best fit of the release data.

Zero order release rate kinetics

To study the Zero order release kinetics the release rate data were fitted to the following equation.

F = K t

Where, 'F' is the fraction of drug release,

'K' is the release rate constant, and

't' is the release time.

When the data is plotted as Cumulative percent drug released versus time, if the plot is linear then the data obeys Zero order release kinetics, with slope equal to K.

First order kinetics

A First order release would be predicated by the following equation.

$$\text{Log } C = \text{Log } Co - \frac{K\,t}{2.30\ 3}$$

Where, C = Amount of drug remained at time 't'

Co = initial amount of drug

K = First order rate constant (hr-1)

When the data is plotted as Cumulative percent drug remaining versus time yields a straight line, Indicating that the release follows First order kinetics .The constant 'K' can be obtained by multiplying 2.303 with slope values.

Hixson-crowell release equation

The Hixson - Crowell release equation is

3 √Q O - 3√Q t = K HC· t

Where,

Q0 = Initial amount of drug

Qt = Cumulative amount of drug release at time "t"

KHC = Hixson Crowell release constant

t = Time in hours.

It describes the drug releases by dissolution and with the changes in surface area and diameter of the particles or tablets. A linear plot of the cube root of the initial concentration minus the cube root of percent remaining versus time in hours for the dissolution data in accordance with the Hixson-crowell equation

Higuchi release model

To study the Higuchi release kinetics, the release rate data were fitted to the following equation.

F = Kt

Where, "F" is the amount of drug release

'K' is the release rate constant, and 't' is the release time.

When the data is plotted as Cumulative drug released Versus Square root of time, yields a straight line, indicating that the drug was released by diffusion mechanism .The slope is equal to 'K'.

Korsmeyer and peppas release model

The release rate data were fitted to the following equation.

Mt / M∞ = K. t n

Where, Mt / M∞ is the fraction of the drug release,

'K' is the release rate constant,

't' is the release time, and

'n' is the diffusional exponent for the drug release

That is dependent on the shape of the matrix dosage form. When the data is plotted as Log of drug released versus log time, yields a straight line with a slope equal to „n" and the „K" can be obtained from Y-intercept.

Table no-5: Diffusion Mechanisms of Drug Release

Diffusion exponent (n)	Overall solute diffusion mechanism
0.45	Fickian diffusion
0.45<n<0.89	Anomalous (non-fickian) diffusion
0.89	Case-II transport
n>0.89	Super case-II transport

Stability Studies

The design of the formal stability studies for the drug product was based on the knowledge of the behavior and properties of the drug substance and formal stability studies on the drug substance. Specification which is list of tests, reference to the analytical procedures and proposed acceptance criteria, including the concept of different acceptable criteria for release and shelf life specifications, is addressed in ICH. The selected batch was kept at 40°C with 75% RH and the samples were withdrawn at 30, 60 and 90 days for physical and *in vitro* evaluation of drug release.

Table no: 6: Storage Conditions in Stability Studies

Study	Storage condition	Minimum time period covered by data at submission
Long term	25^0C/60%RH % Release	3 months
Intermediate	30^0C/75% RH % Release	2 months
Accelerated	40^0C/75% RH % Release	1 month

3. RESULTS

Table no: 7: Different Formulations Batches of Salbutamol Sulphate Buccal Tablets

Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
CORE LAYER										
Salbutamol sulphate	8	8	8	8	8	8	8	8	8	8
HPMC 3cps	20	---	---	---	10	---	---	---	10	10
HPMC 5cps	---	20	---	---	---	10	---	10	---	10
HPMC K4M	---	---	20	---	---	---	10	10	10	---
HPMCK15M	---	---	---	20	10	10	10	---	---	---
Carbopol940	10	10	10	10	10	10	10	10	10	10
Mannitol	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6
Yellow iron oxide	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Magnesium stearate	1	1	1	1	1	1	1	1	1	1
Talc	1	1	1	1	1	1	1	1	1	1
BACKING LAYER										
Ethyl cellulose	38	38	38	38	38	38	38	38	38	38
Magnesium stearate	2	2	2	2	2	2	2	2	2	2
Total weight(mg)	120	120	120	120	120	120	120	120	120	120

Table no: 8: Calibration Curve of Salbutamol

Concentration (µg/ml)	Absorbance at 223nm	Equation of line and regression
0	0	y = 0.0158x - 0.0016 R^2 = 0.9999
10	0.041	
20	0.070	
30	0.105	
40	0.138	
50	0.170	

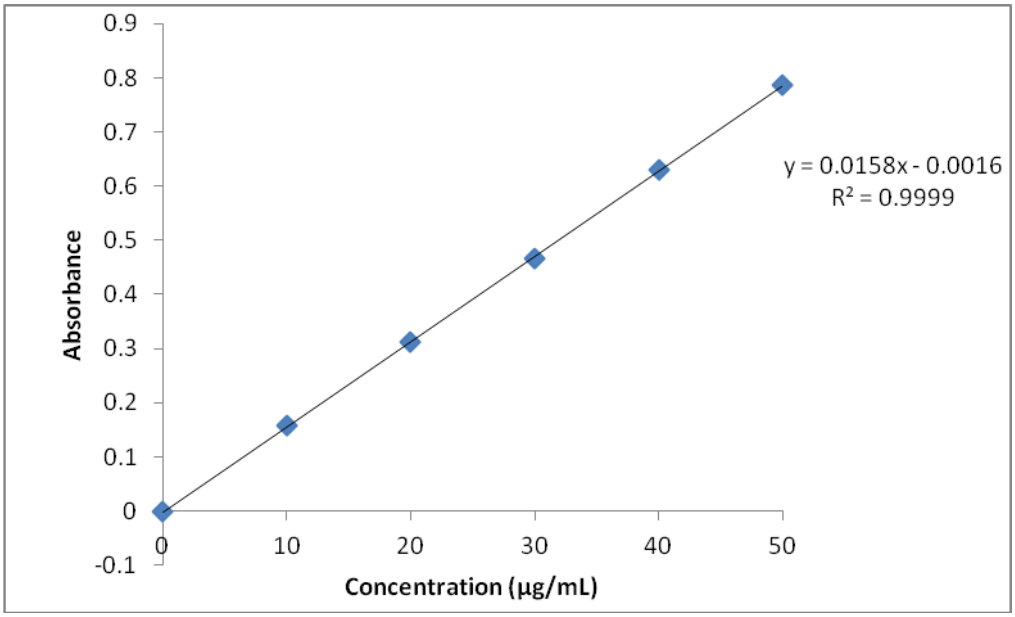

Fig-no- 6: Linearity Curve of Salbutamol Sulphate

Table no: 9: Identification tests of drug

S.No	Parameter	Drug
1	Colour	white
2	Odour	Characteristic
3	Taste	Bitter
4	Appearance	Crystalline powder
5	Solubility	Freely soluble in water, slightly soluble in ethanol (95 %) and in ether, very slightly soluble in dichloromethane.

Table no: 10: Melting point determination test of drug

Reported Melting Point	Observed Melting Point
150-157^{0}c	153^{0}c

3.1. PHYSICAL COMPATIBILITY STUDIES

Table no: 11: Drug Excipient Compatability Studies

API + Excipients	API: Excipients	Initial Observation	Final observation 40°C,75%RH		Conclusion
			2nd week	4th week	
Salbutamol sulphate+ HPMC 3cps	1 :5	White or almost white crystalline powder	No change	No change	Compatible
API+ HPMC 5cps	1 : 5	White colour	No change	No change	Compatible
API +HPMC K4M	1 : 5	White colour	No change	No change	Compatible
API+HPMC	1 : 5	White colour	No change	No	Compatible

K15M				change	
API + Yellow iron oxide	1 : 0.1	Yellow colour	No change	No change	Compatible
API + Carbopol 940	1 : 1	White colour	No change	No change	Compatible
API + Mannitol	1 : 1	White colour	No change	No change	Compatible
API + Ethyl cellulose	1 : 1	White colour	No change	No change	Compatible
API+Magnesium stearate	1:1	White colour	No change	No change	Compatible
API+Talc	1:1	White colour	No change	No change	Compatible

3.2. CHEMICAL COMPATIBILITY STUDIES

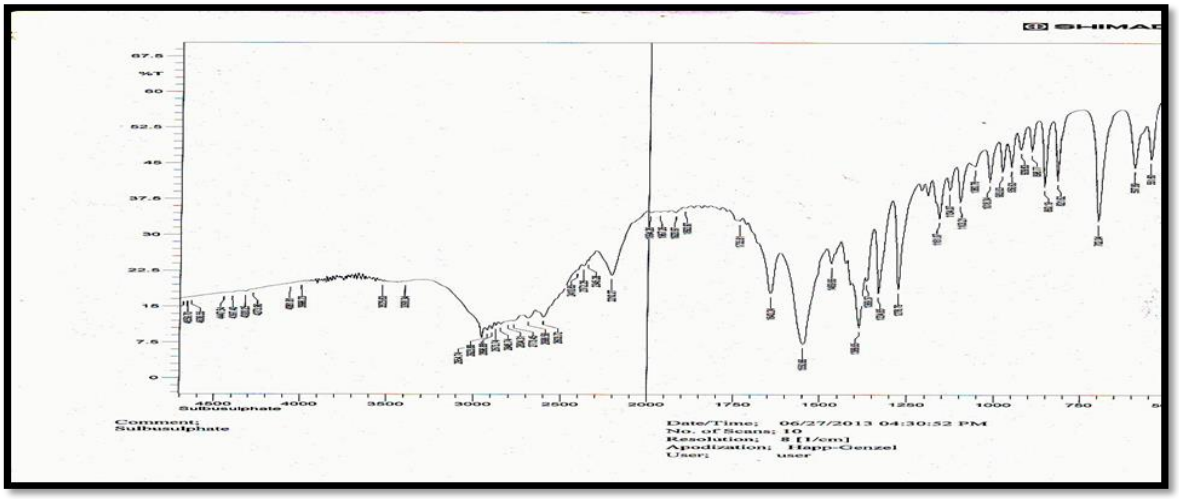

Fig- no-7: FT-IR Spectrum of Salbutamol Sulphate (API)

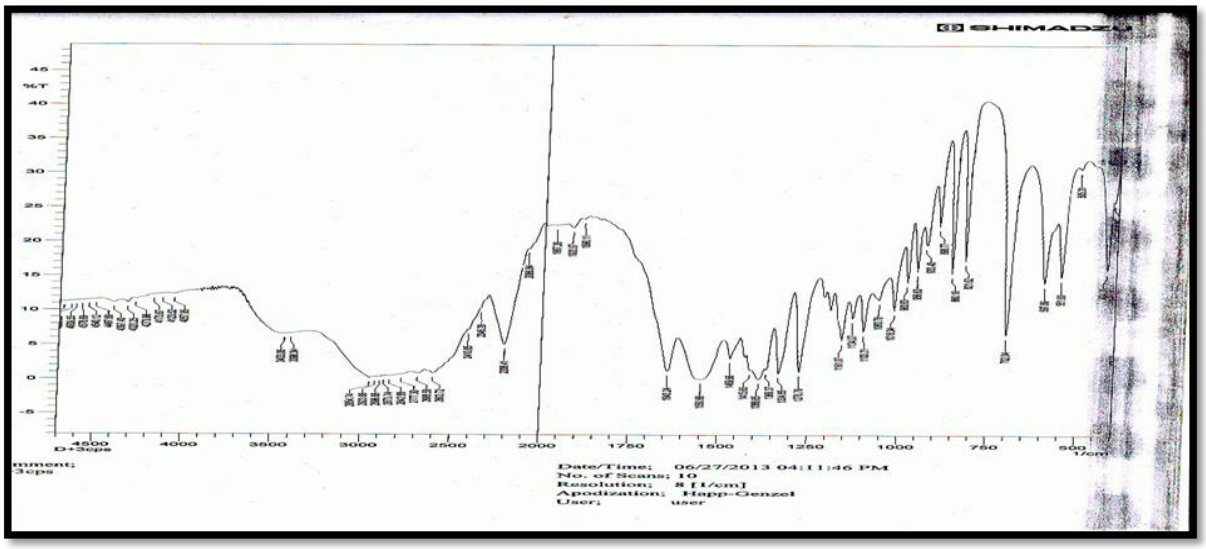

Fig- no-8: FT-IR Spectrum of Salbutamol Sulphate +HPMC 3cp

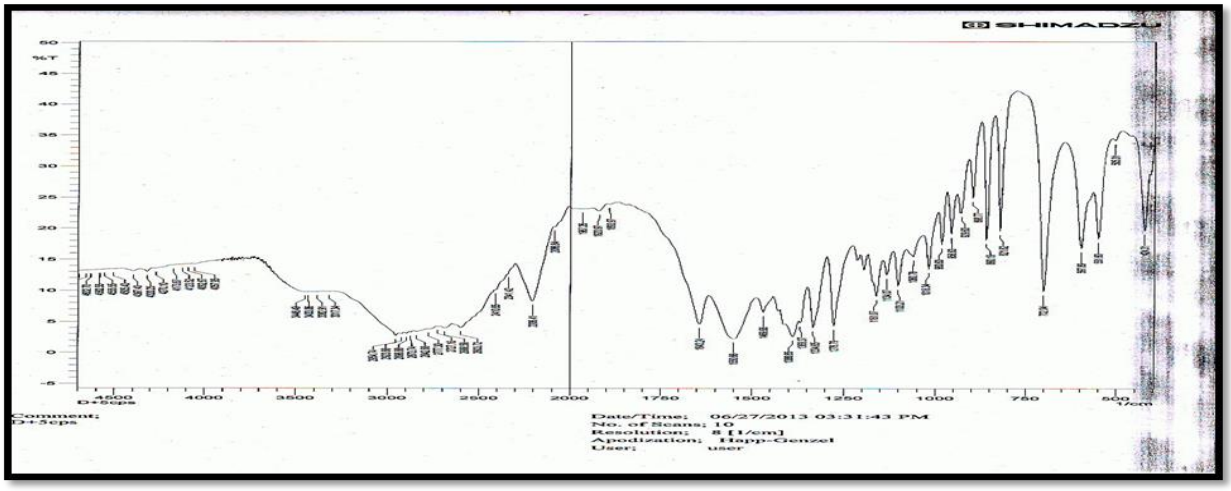

Fig- no-9: FT-IR Spectrum of Salbutamol Sulphate +HPMC 5cps

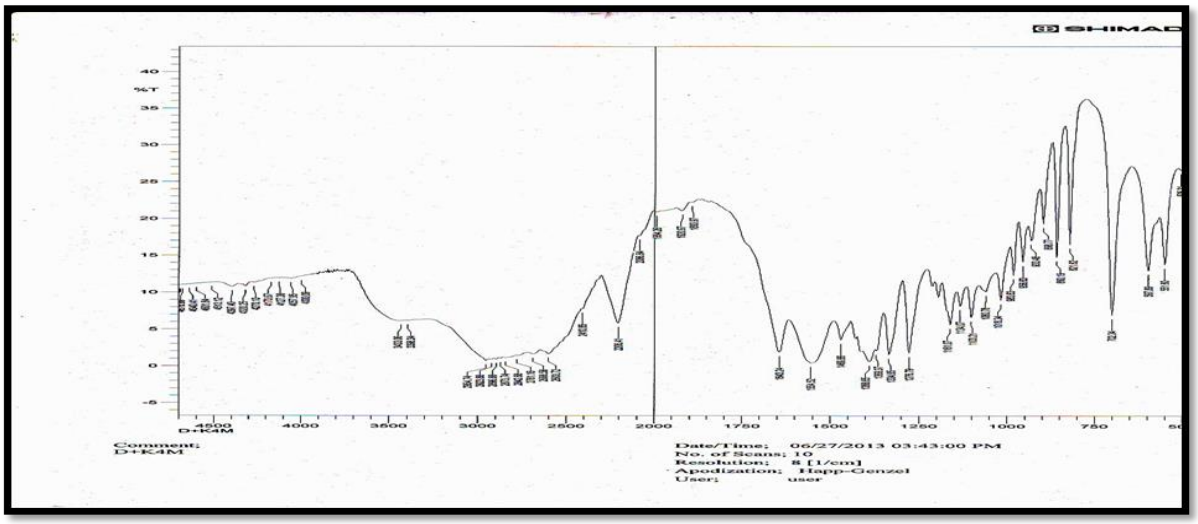

Fig- no-10: FT-IR Spectrum of Salbutamol Sulphate +HPMC K4M

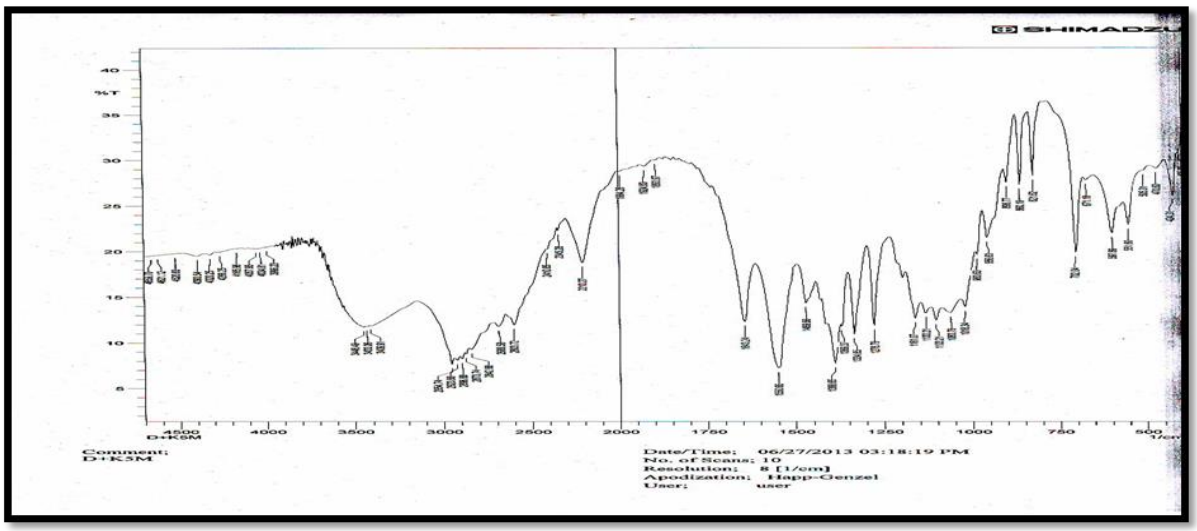

Fig- no-11: FT-IR Spectrum of Salbutamol Sulphate +HPMC K15M

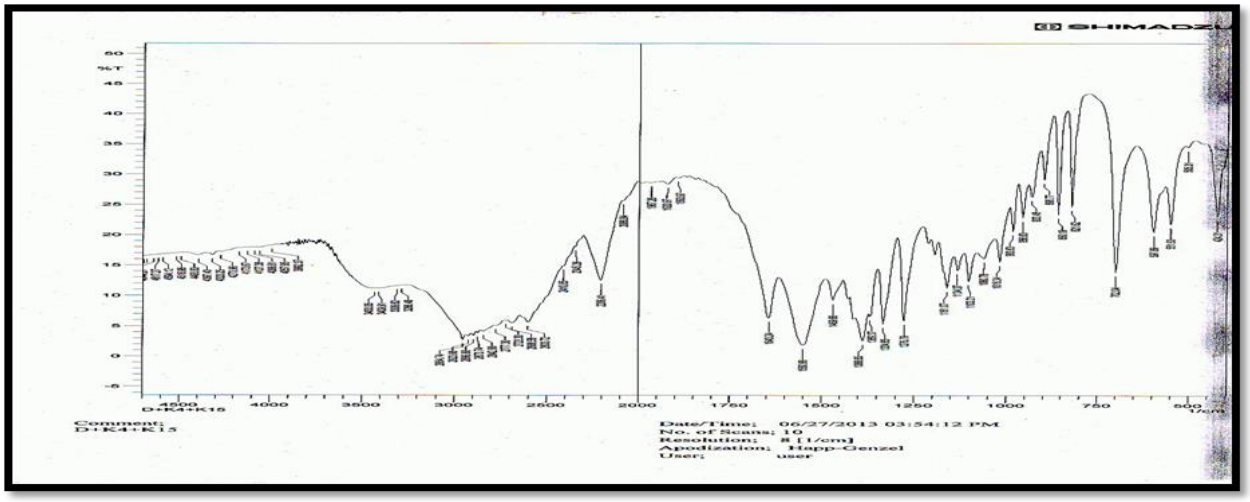

Fig- no-12: FT-IR Spectrum of Salbutamol Sulphate HPMCK4M + HPMCK15M

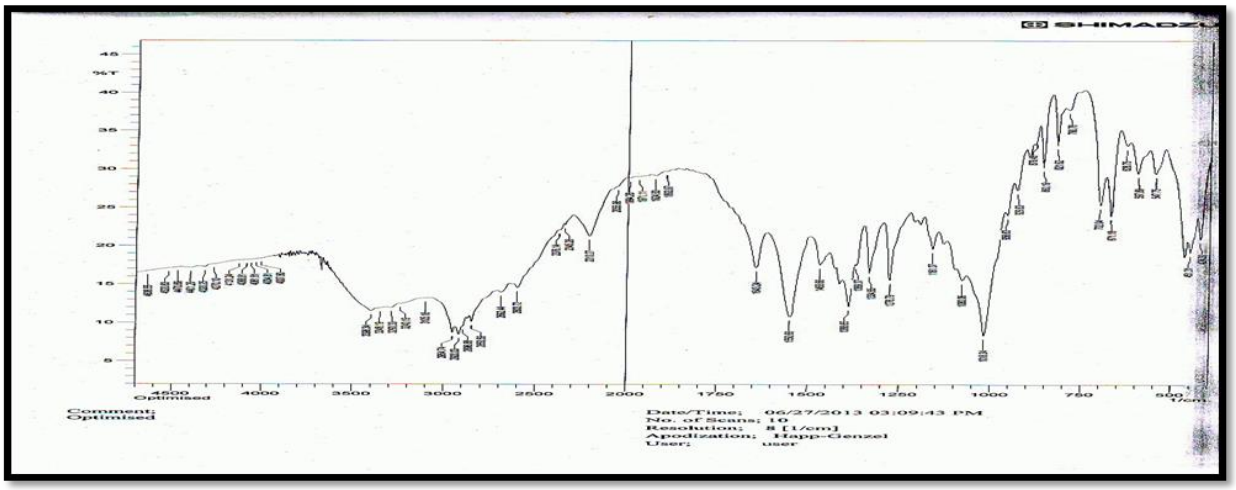

Fig- no-13: FT-IR Spectrum of Optimised Formulation

Table no: 12: Micrometric Properties of Different Formulations

Formulations	Angle of repose(^{0})	Bulk density (g/ml)	Tapped density (g/ml)	Compressibility index	Hausner ratio
F-1	38.86	0.5434±0.10	0.634±0.02	14.30±1.58	1.16±0.01
F-2	42.92	0.5212±0.02	0.629±0.01	17.19±1.22	1.12±0.09
F-3	41.86	0.5137±0.07	0.609±0.01	15.75±0.63	1.18±0.05
F-4	39.09	0.5438±0.09	0.640±0.02	1504±0.60	1.17±0.02
F-5	37.26	0.5345±0.15	0.629±0.03	15.10±0.75	1.17±0.04
F-6	40.59	0.5121±0.02	0.621±0.02	17.53±1.23	1.21±0.01
F-7	28.65	0.5098±0.01	0.599±0.02	15.00±0.58	1.17±0.01
F-8	36.58	0.5342±0.13	0.640±0.01	16.63±0.67	1.19±0.07
F-9	34.24	0.5088±0.01	0.594±0.01	14.35±1.51	1.16±0.01
F-10	36.89	0.5147±0.02	0.609±0.02	15.49±1.59	1.18±0.02

Table no: 13: Evaluation of Post Compressional Parameters of Different Formulations

Formulations	Thickness (mm)	Weight Variation (mg)	Friability (%)	Hardness (kg/cm2)	Surface pH	Swelling Index	Assay (%)
F-1	2.93±0.06	148.7±0.95	0.56±0.02	3.93±0.12	6.56±0.95	42.55±0.56	96.56±0.91
F-2	2.93±0.06	150.5±0.95	0.52±0.87	4.23±0.06	5.23±0.95	57.83±0.99	95.00±0.82
F-3	2.90±0.00	150.2±0.97	0.56±0.67	4.47±0.06	5.77±0.97	78.04±0.98	98.41±0.54
F-4	2.99±0.01	149.6±0.78	0.78±0.01	3.00±1.22	7.08±0.74	27.11±0.01	97.56±0.41
F-5	2.99±0.03	150.1±0.22	0.70±0.00	3.50±0.20	6.94±0.12	38.02±0.24	96.04±1.00
F-6	3.00±1.00	149.0±1.99	0.59±0.12	4.00±0.33	5.00±0.88	45.90±0.41	97.88±0.89
F-7	2.97±0.06	148.6±0.84	0.72±0.98	3.83±0.23	7.43±0.08	40.90±0.89	99.75±0.95
F-8	3.10±0.35	150.2±0.72	0.57±0.43	4.20±0.12	5.12±0.45	60.43±0.22	98.12±1.00
F-9	3.00±0.03	148.8±0.22	0.55±0.33	4.40±0.56	5.08±0.34	81.23±0.45	96.45±0.69
F-10	2.87±0.06	150.7±1.06	0.87±0.03	3.47±0.10	6.87±0.12	29.54±0.09	95.46±0.82

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Table no: 14: Dissolution Profiles of Salbutamol Sulphate Buccal Tablets

Time (hr)	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
0	0	0	0	0	0	0	0	0	0	0
1	12.34	13.43	9.68	14.21	8.12	8.9	20.85	17.96	7.5	9.84
2	22.43	28.9	17.84	30.31	17.5	18.59	43.75	35.31	15.93	20
4	36.54	55.93	38.59	58.12	35.62	36.09	67.34	60.15	30.93	38.75
8	60.92	72.78	57.03	63.24	52.65	54.53	86.79	75.15	51.09	40.32
10	80.56	80.87	60.43	82.96	83.12	85.46	94.68	85.15	60.82	57.34
12	86.34	100.46	94.59	100.62	97.56	95.35	99.85	100.78	81.93	98.12

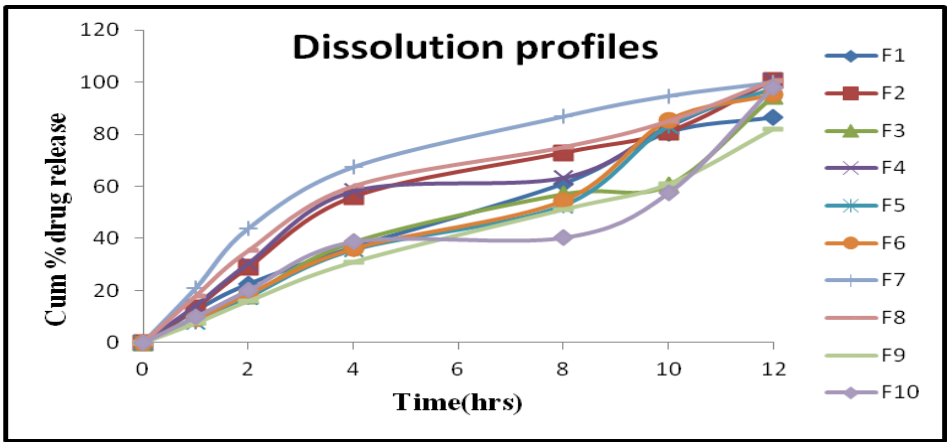

Fig-no-14: Dissolution profiles of F1-F10formulations

Table no: 15: Results of stability studies of optimized formulation F-7

Formulation Code	Parameters	Initial	1 Month	2 Month	3 Month	Limits as per Specifications
F-7	250C/60%RH % Release	99.85	99.75	99.55	99.45	Not less than 85 %
F-7	300C/75% RH % Release	99.85	99.73	99.53	99.43	Not less than 85 %

F-7	400C/75% RH % Release	99.85	99.73	99.63	99.48	Not less than 85 %

Table no: 16: Stability dissolution profile of F-7 for 1st, 2nd & 3rd months

S.NO	Time(hr)	F-7 1Month	F-7 2Month	F-7 3Month
1	0	0	0	0
2	1	20.75	20.72	20.68
3	2	43.65	43.62	43.59
4	4	67.24	67.21	67.18
5	8	86.69	86.63	86.59
6	10	94.58	94.54	94.50
7	12	99.73	99.63	99.48

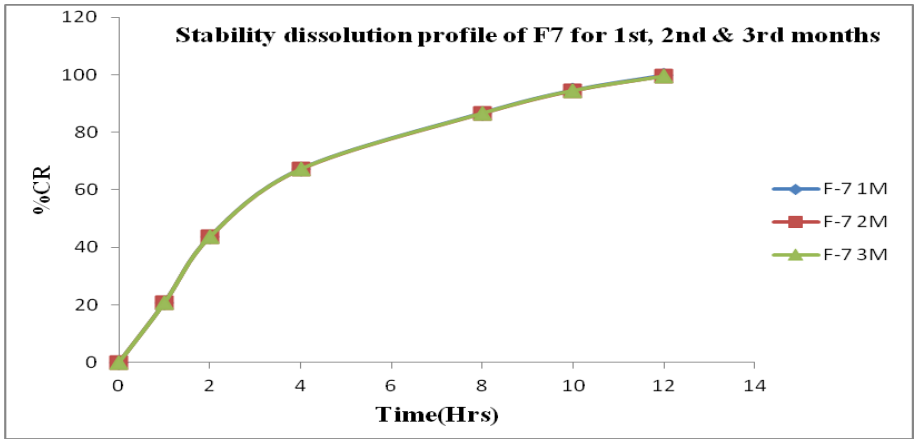

Fig- no-15: Stability Dissolution Profile of F7 for 1st, 2nd and 3rd months

Table no: 17: Drug Release Kinetics

Formulation Code	Drug release kinetics (R^2)				Release exponential (n)
	Zero order	First order	Higuchi plot	Peppas plot	
F1	0.988	0.737	0.961	0.731	1.26
F2	0.951	0.778	0.971	0.699	1.27
F3	0.957	0.620	0.910	0.771	1.29
F4	0.935	0.757	0.955	0.679	1.25
F5	0.981	0.734	0.908	0.814	1.36
F6	0.983	0.755	0.918	0.799	1.35
F7	0.892	0.956	0.982	0.603	1.20
F8	0.934	0.816	0.983	0.638	1.21
F9	0.984	0.611	0.937	0.811	1.30
F10	0.887	0.567	0.826	0.737	1.23

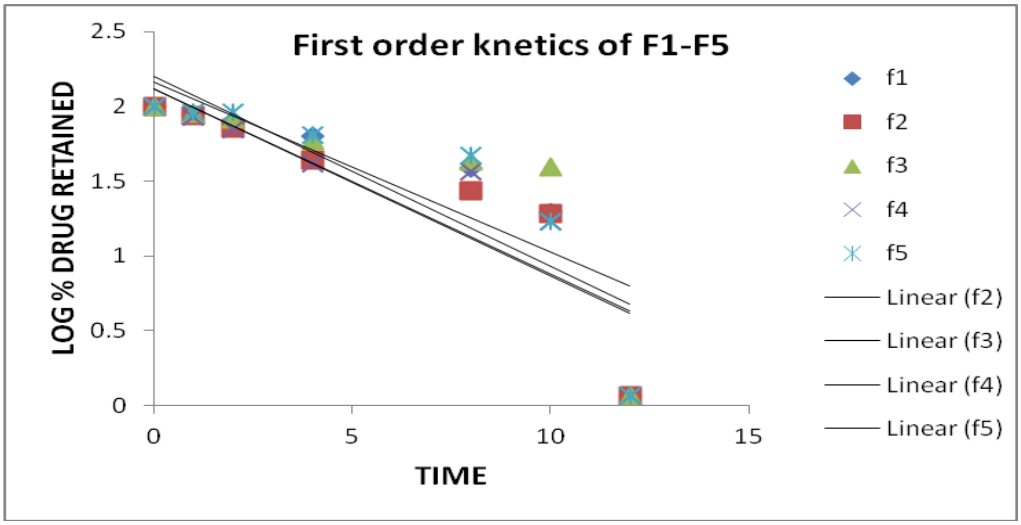

Fig-no-16: In-Vitro Release Profile of F1-F5 According to First order Kinetics

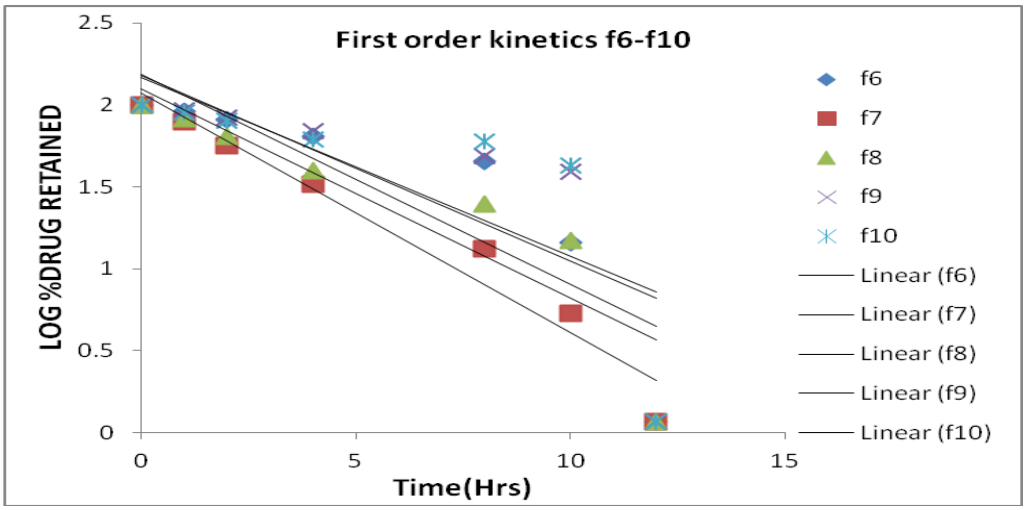

Fig-no-17: In-Vitro Release Profile of F6-F10 According to First order Kinetics

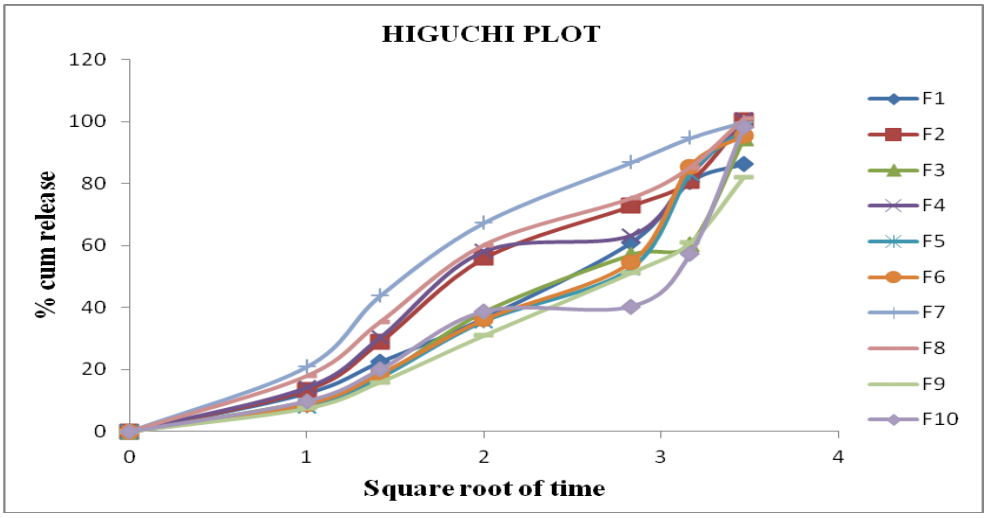

Fig-no-18: In-Vitro Release Profile of F1-F10 According to Higuchi Plot

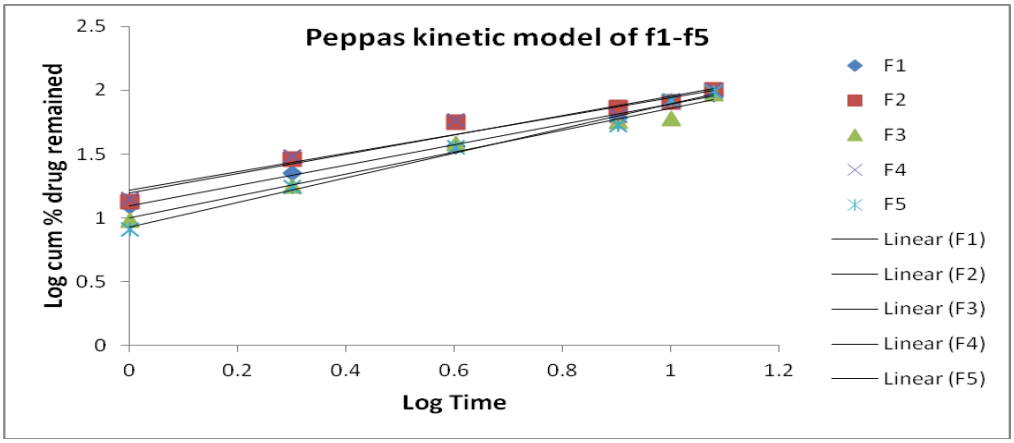

Fig-no-19: In-Vitro Release Profile of F1-F5 According to Peppas Model

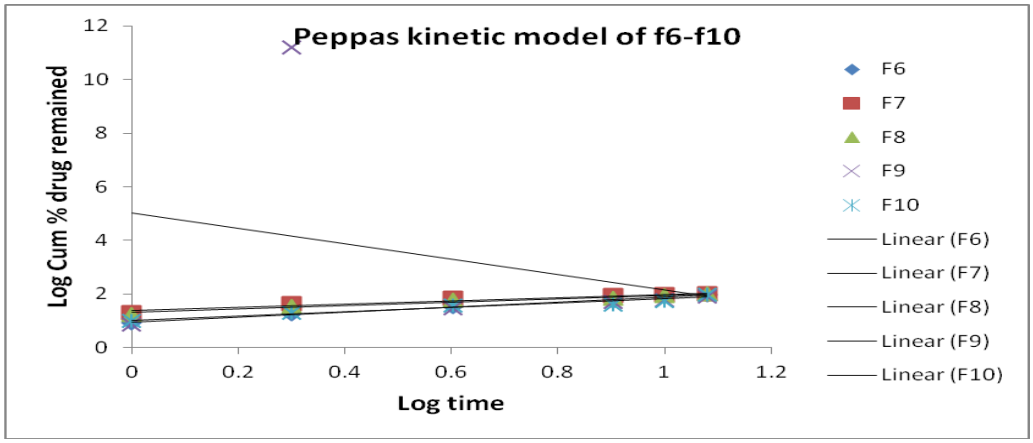

Fig-no-20: In-Vitro Release Profile of F6-F10 According to Peppas Model

4. CONCLUSION

The results of the present study indicate that buccoadhesive bilayer tablets of salbutamol sulphate with sustained drug release can be successfully prepared by direct compression method using HPMC 3cps, HPMC 5cps, HPMC K4M, HPMC K15M along with Carbopol 940 as mucoadhesive polymers and ethyl cellulose as backing layer. It exhibited well sustained and delayed release pattern. The formulation F7 containing hydroxypropyl methylcellulose K4M, K15M, Carbopol 940, and mannitol was found to be promising, which shows an in vitro drug release of 99.85% in 12 h along with satisfactory results. From the above experimental results it can be concluded that mucoadhesive bilayer buccal tablets of salbutamol sulphate can be prepared by using different proportion & combination of Excipients and we selected F7 as best formulation based on dissolution profile and physical characteristics. Formulation (F7) showed total drug release in 12hr and showed fair flow properties when compared to other formulations. The formulations F7, followed first order kinetics.

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