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Formulation, Optimization and Evaluation of Oral Buoyant Effervescent Tablets of Salbutamol Sulphate

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Keywords: Salbutamol sulphate; HPMC K4M; Polyox WSR 1105; GFDDS; effervescent tablets; sodium bicarbonate.

ABSTRACT

The purpose of the present study was to develop an optimized gastric floating drug delivery system (GFDDS) containing salbutamol sulphate as a model drug. Oral buoyant effervescent tablets were developed to prolong gastric residence time, leading to an increase in drug bioavailability. Tablets were prepared by direct compression technique, using polymers such as hydroxypropyl methylcellulose HPMC K4M and Polyox WSR 1105. Sodium bicarbonate was used as an effervescent substance to aid buoyancy to the dosage form due to the liberation of CO_2 when it comes in contact with the acidified dissolution medium which is entrapped in the matrix. Microcrystalline cellulose was used as diluents. Magnesium stearate (1%w/w) and talc (1%w/w) were used as an lubricant and glidant respectively. Tablets were evaluated for their physical characteristics, viz., hardness, weight variation, friability, thickness, floating lag time, tablet length, drug content. Further, tablets were studied for in vitro dissolution studies, in vitro buoyancy tests and swelling index determination. Buoyant tablets were optimized using composite experimental design. Thirteen formulations of salbutamol sulphate were prepared by direct compression using HPMC K4M and Polyox WSR 1105. Numerical optimization was performed to identify the best formulation. The predicted values agreed well with the experimental values, and the results demonstrate the feasibility of the model in development.

INTRODUCTION

Salbutamol [1-(4-hydroxy-3-hydroxymethyl phenyl)-2-(t-butyl amino) ethanol], also known as albuterol is a selective β_2 adrenoreceptor agonist. At therapeutic doses it acts on adrenoreceptors of bronchial muscle, with little or no action on the β_2 adrenoreceptors of the heart. It is suitable for the management and prevention of attacks in asthma and other forms of allergic airway diseases [1-3]. It is an antiasthmatic and bronchodilator agent, with half-life of 1.6 hours. And require multiple daily doses to maintain adequate plasma concentrations. Unpredictable gastric residence time (GRT) of a controlled release dosage form leads to interest in targeting and retaining the dosage form in the stomach for a prolonged period of time. Gastro-retentive dosage forms (i.e., those designed to exhibit a prolonged residence time) have been a topic of interest in terms of their potential for prolonged drug delivery [4]. These dosage forms are particularly appropriate for drugs (a) that are locally active to the gastric mucosa in the stomach, for example, antibiotic administration for *helicobacter pylori* eradication in the treatment of peptic ulcer disease [5]; (b) with an absorption window in the stomach or in the upper small intestine (c) that are unstable in the intestine or colonic environment; and (d) with low solubility at high pH values [6]. It is widely accepted that gastric emptying of conventional dosage forms in humans is affected by numerous factors and the time taken shows wide inter and intra-subject variation. This variability, in turn, can lead to unpredictable times in achieving peak plasma drug levels and bioavailability, since many drugs absorb to the greatest extent in the upper part of the small intestine [7]. It was suggested that compounding narrow absorption window drugs in a unique pharmaceutical DF (Dosage Form) with gastro retentive properties would enable an extended absorption phase of these drugs. After oral administration, such a DF would be retained in the stomach and release the drug there in a sustained manner, so that the drug could be supplied continuously to its absorption sites in the upper gastrointestinal tract. This mode of administration would best achieve the known pharmacokinetic and pharmacodynamic advantages of SR-DFs (Sustained release dosage forms) for these drugs. Controlled gastric retention of solid dosage forms may be achieved by the mechanism of floating systems, swelling and expanding systems, modified shape systems, high-density systems or other delayed gastric emptying devices. The principle of buoyant preparation offers a residence time for the dosage forms and sustained drug release [8]. The various buoyant preparations include micro balloons, granules, powders, capsules, tablets, and laminated films. Based on the mechanism of buoyancy, two distinctly different technologies,

i.e., non-effervescent and effervescent systems have been utilized in the development of floating systems. Effervescent systems utilize matrices prepared with swellable polymers such as methocel or chitosan and effervescent compounds, *e.g*., sodium bicarbonate and citric or tartaric acid, or matrices containing chambers of liquid that gasify at body temperature [9]. Salbutamol has a site-specific absorption in stomach and upper part of small intestine [10]. This drug has oral bioavailability of ~40%; undergo first-pass metabolism, intestinal sulphonation and also degradation in colon [11]. Thus, salbutamol sulphate is a candidate for the development of a gastro-retentive drug delivery system. The present research aims to formulate, optimized and evaluate gastro retentive drug delivery system for salbutamol sulphate that could give site specific and controlled drug release.

1. MATERIALS AND METHODS

1.1 Materials

Salbutamol sulphate was provided by Martin and Brown Pvt. Ltd., Hisar (India). Polyox WSR 1105 NF was a generous gift from Dow Chemicals, USA. HPMC K4M and K15M were obtained by Colocorn, Goa (India). Sodium bicarbonate, magnesium stearate and talc were procured from S.D Fine-Chem Ltd., Mumbai and all chemicals reagents used were of analytical grade.

1.2 Methodology

Preparation of buoyant effervescent tablets

Salbutamol was mixed with HPMC K4M and Polyox WSR 1105 as shown in Table 1 to formulate the floating tablets. Sodium bicarbonate was used as a gas-generating agent and microcrystalline cellulose was used as diluent. Magnesium stearate (1%w/w) and talc (1%w/w) were used as a lubricant and glidant respectively. The amount of the drug in all of the formulations was kept constant i.e. 3.84% (9.6 mg in each tablet). All the ingredients except magnesium stearate were sifted from # 40 mesh and mixed in a lab scale blender for 15 minutes and then magnesium stearate was sifted from # 60 mesh and lubrication was done for 5 minutes. The lubricated blend was directly compressed in a tablet compressing machine fitted with concave punches and dies (9.0 mm diameter). The tablet weight was adjusted to 250 mg.

Table 1: Composition of the oral buoyant tablet of salbutamol sulphate for central composite design

Ingredients	Formulation code												
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13
Salbutamol Sulphate (mg)	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
HPMC K4M (%)	30	30	30	40	40	40	50	50	50	40	40	40	40
Polyox WSR 1105 (%)	10	15	20	10	15	20	10	15	20	15	15	15	15
Sodium bicarbonate (%)	10	10	10	10	10	10	10	10	10	10	10	10	10
Avicel PH 102	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s
Magnesium stearate (%)	1	1	1	1	1	1	1	1	1	1	1	1	1
Talc (%)	1	1	1	1	1	1	1	1	1	1	1	1	1
Total weight (mg)	250	250	250	250	250	250	250	250	250	250	250	250	250

Experimental Design

The amount of HPMC K4M (X_1) and Polyox WSR 1105 (X_2) were selected as the factors, studied at 3 levels each. The central point (0, 0) was studied in quintuplicate. All other formulation and processing variables were kept invariant throughout the study. Table 2 summarizes an account of the 13 experimental runs studied, their factor combinations, and the translation of the coded levels to the experimental units employed during the study. Floating lag time, percentage drug release at 1^{st} h, total floating time and percentage drug release after 12^{th} h were taken as the response variables.

Table 2: Factor combination as per the chosen experimental design

Formulation Code	Coded Factor levels	
	X_1	X_2
A1	-1	-1
A2	-1	0
A3	-1	+1
A4	0	-1
A5	0	0
A6	0	+1
A7	+1	-1
A8	+1	0
A9	+1	+1
A10	0	0
A11	0	0
A12	0	0
A13	0	0
Translation of coded levels in actual units		
Coded level	-1 +1	0
X_1 : HPMC K4M (%)	30 50	40
X_2 : Polyox WSR 1105 (%)	10 20	15

Physical Evaluation of tablets

Tablets were evaluated for mechanical strength using a Monsanto tablet hardness tester. A friability test was done by a friability tester, and thickness and length was examined with vernier caliper [12, 13].

Drug Content

Five randomly selected tablets of each batch were weighed and powdered in a pestle and mortar. The powdered tablet is equivalent to 9.6 mg drug in one tablet was taken and transferred in a 250 mL flask containing 100 ml of 0.1 N HCl (pH 1.2). The flask was shaken on a flask shaker for 24 hours and was kept for 12 hours for the sedimentation of undissolved materials. The solution is filtered through the Whatman filter paper. 10 mL of this filtrate was taken and appropriate dilution was made. The samples were analysed at 276 nm using UV visible spectrophotometer [14].

Uniformity of weight

Twenty tablets were individually weighed and the average was calculated. From the average weight of the prepared tablets, the standard deviation was determined [15].

In vitro buoyancy test

In vitro, buoyancy test was done to calculate the floatation lag time. The prepared tablets were subjected to in vitro buoyancy test by placing them in 100 mL beaker containing 100 mL 0.1 N HCl (pH 1.2, temp. 37±0.5°C) [16].

Swelling index determination

Salbutamol sulphate tablets were weighed individually (designated as W_1) and placed in 900 mL of dissolution medium. The temperature was maintained at 37°C. At regular 1 h time intervals, the samples were removed using a small basket and the excess surface liquid was removed carefully using the Whatman filter paper. The swollen tablets were then re-weighed (W_2) and percentage swelling index (% SI) was calculated using the following formula [17].

The percentage swelling index of the optimized formulation was calculated using the formula shown in **eqn. 1.**

$$\% SI = (W_2 - W_1) / W_1 \times 100 \quad \text{.....(1)}$$

In vitro dissolution study

In vitro dissolution study was carried out in 900 mL of 0.1N HCl (pH 1.2) using USP II apparatus for 12 hours at constant temperature of 37± 0.5 °C. The rotational speed of the paddle was maintained at 50 rpm. 10 mL of sample solution was withdrawn by the auto

sampler at specified interval of time. Further sample was filtered through Whatman filter paper and absorbance was measured at λ_{max} 276 nm using a double beam UV visible spectrophotometer. Then the concentration was determined from the standard curve of salbutamol sulphate in 0.1N HCl (pH 1.2) at λ_{max} 276 nm [18-20].

Data analysis

In the present study, raw data obtained from in vitro release studies were analyzed using PCP Disso v3 software wherein data were fitted to different equations and kinetic models to calculate the percent drug release and release kinetics of salbutamol sulphate from the floating tablets. The software has inbuilt provisions for applying the correction factor of volume and drug losses during sampling. The kinetic models used were the Zero order equation, First order, Hixson-Crowell model, matrix model and Korsmeyer-Peppas models.

Scanning electron microscopy (SEM) of tablets

The surface morphology of the tablet membrane film of optimized formulation was examined before and after dissolution using scanning electron microscope. The samples were fixed on a brass stub using double-sided tape and then gold coated in a vacuum by a sputter coater. The pictures were taken at an excitation voltage of 20 KV.

RESULTS AND DISCUSSION

Evaluation of floating tablets of salbutamol sulphate

Physical parameters

All the prepared tablet formulations were evaluated in terms of various parameters *viz.*Hardness, friability, weight variation, drug content uniformity, length and thickness, in vitro dissolution studies and analysis of dissolution data, in vitro buoyancy test, and swelling index determination. Table 3 includes the values (Mean±S.D.) of hardness, friability, weight variation, drug content, length and thickness of all prepared formulations.

Table 3: Values of physical parameters and drug content for all tablet formulations of salbutamol sulphate

Formulation code	Hardness (Kg/cm^2) Mean ± S.D.	Length (mm) Mean ± S.D.	Thickness (mm) Mean ± S.D.	Friability (%)	Uniformity of content (%)	Weight (mg) Mean ± S.D.
A1	4.8 ± 0.25	9.10±0.04	3.10 ± 0.12	0.40	99.02	250.42 ± 0.68
A2	4.5 ± 0.29	9.09±0.01	3.13 ± 0.07	0.50	95.51	250.40 ± 2.73
A3	4.3 ± 0.29	9.09±0.06	3.12 ± 0.17	0.56	96.45	246.09 ± 0.70
A4	4.7 ± 0.65	9.10±0.04	3.12 ± 0.07	0.50	96.01	250.38 ± 1.51
A5	4.4 ± 0.18	9.10±0.01	3.11 ± 0.04	0.52	97.43	251.60 ± 1.20
A6	5.0 ± 0.31	9.12±0.08	3.13 ± 0.07	0.36	98.67	253.13 ± 2.03
A7	4.7 ± 0.13	9.08±0.03	3.09 ± 0.07	0.43	96.67	251.10 ± 1.41
A8	4.6 ± 0.35	9.13±0.01	3.10 ± 0.04	0.48	98.89	252.19 ± 1.13
A9	4.6 ± 0.33	9.12±0.05	3.12 ± 0.12	0.43	102.34	248.93 ± 1.29
A10	4.2 ± 0.60	9.11±0.03	3.09 ± 0.05	0.61	96.02	251.82 ± 0.41
A11	5.0 ± 0.51	9.10±0.02	3.11 ± 0.13	0.37	94.07	247.05 ± 0.66
A12	4.9 ± 0.17	9.11±0.03	3.16 ± 0.21	0.38	97.34	248.26 ± 3.26
A13	5.1 ± 0.32	9.09±0.05	3.10 ± 0.12	0.32	99.45	252.10 ± 0.95

In vitro buoyancy test

The floating lag time (FLT) of all tablet formulations was found to be less than 3 minutes and the total floating time was observed to be more than 12 h as tabulated in table 4. On increasing the concentration of polymers, the floating lag time was found to be increased as shown in figure 1 and table 4. As the concentration of HPMC K4M and Polyox WSR 1105 was increased, floating lag time for formulation A1-A3 was found to be in the range of 125-130, in case of A4-A6 was 160-174 sec, with A7-A9 it was 206-225 sec and for A10-A13, it was 166-169 sec as depicted in table 5. Minimum FLT i.e.. 125 sec was found to be for A11 formulation containing 30% of HPMC K4M and 10% of Polyox WSR 1105 and maximum of 225 sec for A9 formulation containing 50% of HPMC K4M and 20% Polyox WSR 1105 [21-24].

Table 4: Floating lag time and total floating time of all tablet formulations

Formulation code	Floating lag time (sec)	Total floating time (h)
A1	125	>12 h
A2	128	>12 h
A3	130	>12 h
A4	160	>12 h
A5	169	>12 h
A6	174	>12 h
A7	206	>12 h
A8	212	>12 h
A9	225	>12 h
A10	168	>12 h
A11	169	>12 h
A12	166	>12 h
A13	168	>12 h

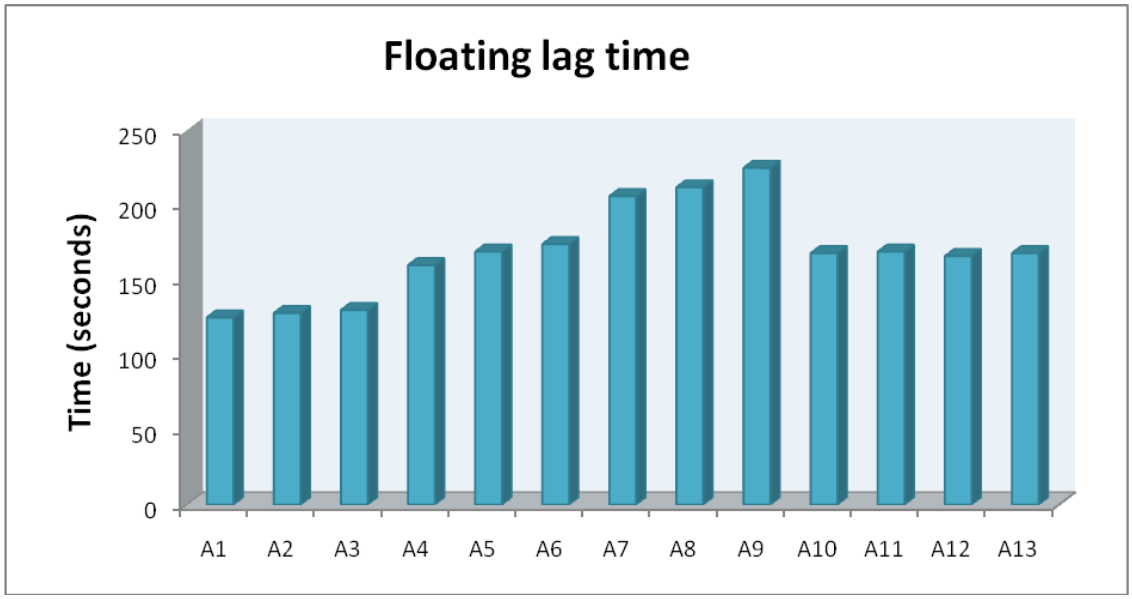

Fig. 1. Floating lag time of different formulations

In vitro dissolution test

In vitro dissolution, studies were carried out using PCP-v3 dissolution software. This software is pharmaceutical dissolution testing and analysis software to time-saving analysis of dissolution data. Drug release kinetics studies can also be done with the help of software. The in-vitro dissolution rate was studied using USP dissolution apparatus II (paddle type) in pH 1.2 buffers for 12 h. The percentage of drug release was calculated using this software. Mean value of drug release of all tablet formulations is shown in tables 4, 5. Drug release from formulations A1-A3 containing minimum polymer concentration was found to be 98.595%-99.715%. Drug release from formulations A7-A9 was found to be 84.446%-87.770% i.e. highly sustained due to the presence of maximum polymer concentration. High polymer concentration causes increase in the viscosity of the gel as well as the formation of gel layer with a longer diffusion path. This could cause a decrease in the effective diffusion coefficient of the drug and therefore reduction in the drug release [25-28].

Table 5: Dissolution data of formulation A1-A6

Time (h)	% Drug Release±S.D.					
	A1	**A2**	**A3**	**A4**	**A5**	**A6**
0	0.000	0.000	0.000	0.000	0.000	0.000
1	27.353±3.03	28.676±2.29	29.338±3.03	23.382±3.03	25.368±3.03	26.029±3.03
2	35.598±3.04	36.275±1.99	38.267±2.02	29.468±3.05	32.267±1.96	34.260±2.02
3	43.270±5.04	45.277±3.06	46.630±4.03	35.587±3.06	38.578±1.99	42.578±4.03
4	54.331±3.10	56.360±1.18	58.390±2.97	43.063±2.99	48.962±1.97	46.353±2.97
5	67.495±1.99	66.900±3.04	65.642±3.96	50.578±3.97	53.429±2.02	56.120±3.96
6	75.505±3.14	73.578±3.10	75.615±3.12	58.797±1.97	63.270±3.09	64.640±4.24
7	81.6101±0.12	82.971±1.92	80.397±4.24	64.412±4.12	66.596±3.45	64.640±4.24
8	90.422±3.06	89.811±2.08	83.900±2.15	70.056±5.03	70.613±2.19	72.605±2.15
9	95.350±2.99	94.733±1.93	86.770±1.90	79.039±4.18	78.637±4.08	78.667±1.90
10	97.676±1.95	96.390±4.07	94.294±0.98	85.423±5.04	83.434±3.00	84.787±0.98
11	99.091±0.54	98.054±1.24	98.120±1.31	92.501±7.23	90.260±2.25	90.304±1.31
12	99.715±0.15	99.064±1.09	98.595±0.16	98.293±1.23	96.490±1.96	94.549±0.16

Table 6: Dissolution data of formulations A7-A13

Time (h)	% Drug Release±S.D.						
	A7	**A8**	**A9**	**A10**	**A11**	**A12**	**A13**
0	0.000	0.000	0.000±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.000±0.00
1	18.088±1.99	20.074±1.99	21.397±3.03	24.044±1.99	24.375±2.07	24.574±2.82	24.706±1.15
2	25.569±3.04	28.238±2.00	27.591±3.06	30.929±3.02	31.330±3.67	31.729±3.21	31.333±2.55
3	32.468±2.02	34.505±2.02	35.174±3.08	37.225±2.28	37.631±1.59	37.836±1.79	37.436±2.46
4	37.456±3.09	40.176±3.08	42.176±5.09	48.221±1.12	48.829±0.10	49.301±0.85	48.235±1.13
5	45.142±4.06	48.554±3.12	46.605±4.22	52.054±1.14	52.735±1.13	52.087±1.12	52.465±0.99
6	51.586±1.89	53.049±2.91	50.417±2.92	61.880±2.00	62.303±1.42	61.648±2.39	61.237±3.03
7	62.066±3.89	60.235±3.88	58.897±2.95	66.515±3.45	67.207±3.03	67.736±3.00	67.320±2.99
8	68.686±3.94	68.819±1.96	65.480±2.91	69.870±2.98	69.908±3.01	70.443±3.88	70.022±3.21
9	73.387±3.98	76.767±2.33	72.130±3.01	77.225±6.36	77.727±6.92	77.937±7.15	78.173±6.71
10	78.794±3.14	79.618±3.09	76.199±2.10	87.598±9.92	88.007±12.84	87.358±10.27	87.598±9.92
11	83.591±3.17	82.436±3.13	80.304±1.18	88.826±2.20	89.590±1.94	89.927±2.07	89.574±1.92
12	87.770±2.16	86.600±2.25	84.446±3.15	95.703±1.14	95.945±1.33	96.352±1.76	96.194±1.54

In vitro release kinetics

The data obtained from dissolution studies of different batches were analysed for different mathematical models to determine the release kinetics. The kinetics models used were zero order, first order, matrix model, hixson-crowell model and Korsmeyer-Peppas model. The final results are reproduced in table 8. Most of the batches followed Korsmeyer-Peppas model however some batches followed Matrix model and Hixson- Crowell model.

Table 7: Modeling of dissolution data of all tablet formulations

Formulation code	Zero order		First order		Matrix model		Peppas model		Hixson-crowell model	
	R	K_0	R	K_F	R	K_M	R	K_P	R	K_{HC}
A1	0.9021	10.234	0.9057	-0.3816	0.9879	29.9724	0.9880	25.3935	0.9858	-0.0699
A2	0.8896	10.187	0.9037	-0.3456	0.9906	29.8958	0.9894	26.6800	0.9827	-0.0671
A3	0.8732	9.990	0.8941	-0.3169	0.9949	29.3839	0.9927	28.0474	0.9822	-0.0634
A4	0.9629	8.832	0.8677	-0.2277	0.9740	25.5518	0.9814	20.0795	0.9544	-0.0506
A5	0.9311	8.880	0.9189	-0.2034	0.9883	25.8898	0.9881	22.8592	0.9731	-0.0485
A6	0.9202	8.8641	0.9340	-0.1994	0.9899	25.8896	0.9887	24.0467	0.9763	-0.0480
A7	0.9697	8.0874	0.9782	-0.1543	0.9730	23.3563	0.9911	16.3676	0.9926	-0.0404
A8	0.9532	8.1565	0.9816	-0.1543	0.9809	23.6709	0.9908	8.4824	0.9905	-0.0405
A9	0.9415	7.8928	0.9823	-0.1428	0.9836	22.9571	0.9878	19.3537	0.9874	-0.0382
A10	0.9380	8.7597	0.9320	-0.1929	0.9861	25.5065	0.9880	21.7012	0.9763	-0.0470
A11	0.9355	8.8906	0.9008	-0.2081	0.9838	25.824	0.9864	21.9632	0.9613	-0.0490
A12	0.9361	8.9034	0.9029	-0.2127	0.9834	25.9179	0.9857	22.1341	0.9623	-0.0496
A13	0.9390	8.8815	0.9027	-0.2104	0.9830	25.8416	0.9860	22.0109	0.9623	-0.0493

K_0 = Zero order rate constant; K_F = First order rate constant; K_M = Matrix rate constant; K_P = Korsmeyer Peppas rate constant; K_{HC} = Hixson Crowell rate constant; R = Regression coefficient

Response surface analysis

The 3-Dimensional response surface plots are shown in fig.2, 3 and 4. The corresponding contour plots for the studied response properties lag time, percentage drug released at 1st hour and percentage of drug released at 12th hour are shown in Fig. 5, 6 and 7 respectively.

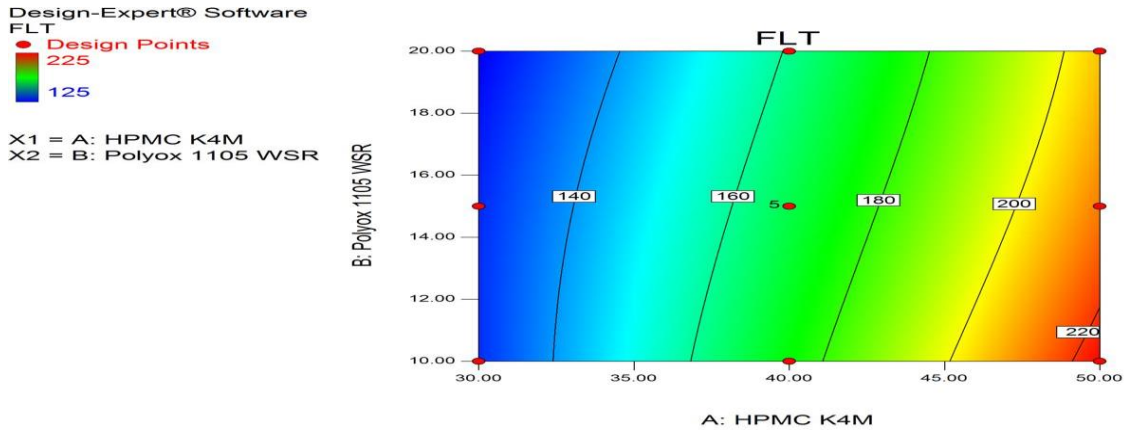

Fig. 2: Contour plot showing the influence of HPMC K4M and Polyox WSR 1105 on floating lag time

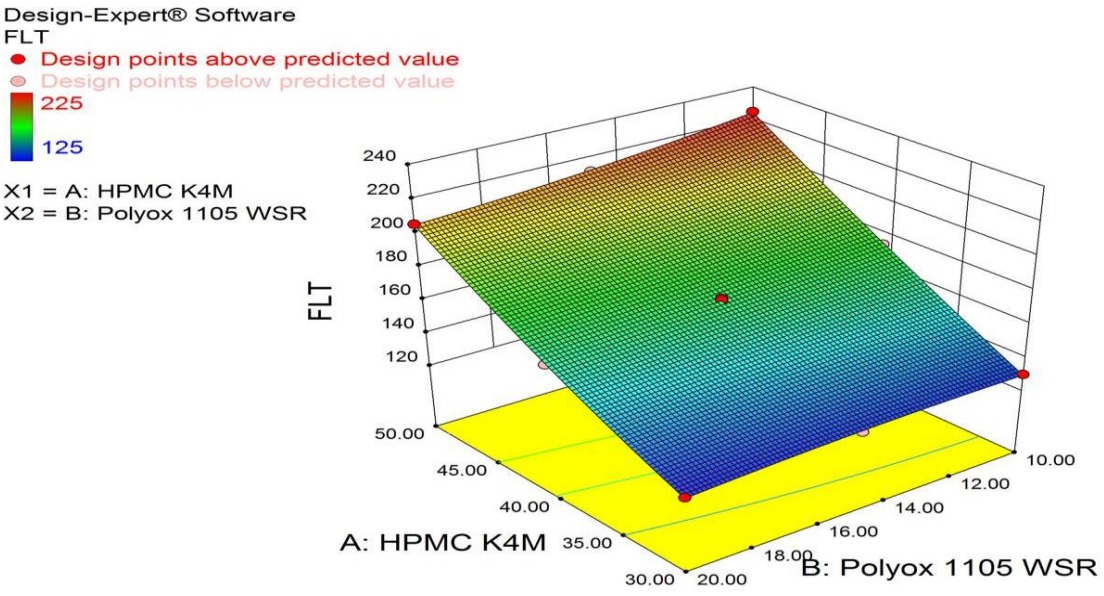

Fig. 3: Response surface plot showing the influence of HPMC K4M and Polyox WSR 1105 on floating lag time

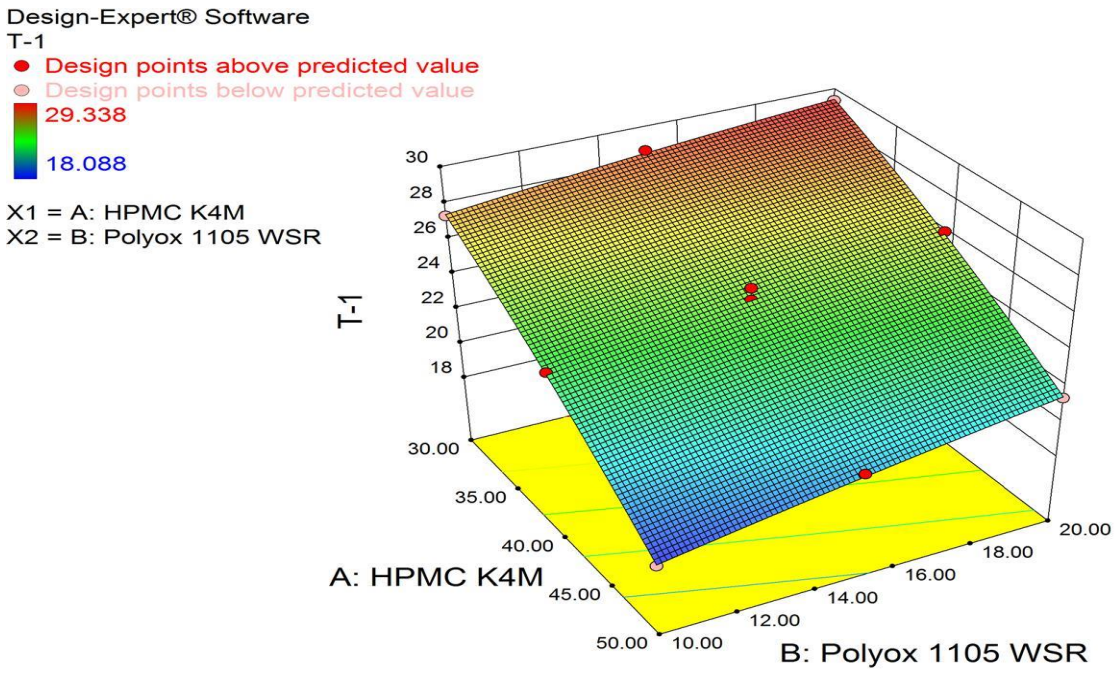

Fig. 5: Response surface plot showing the influence of HPMC K4M and Polyox WSR 1105 on drug release at 1st hour

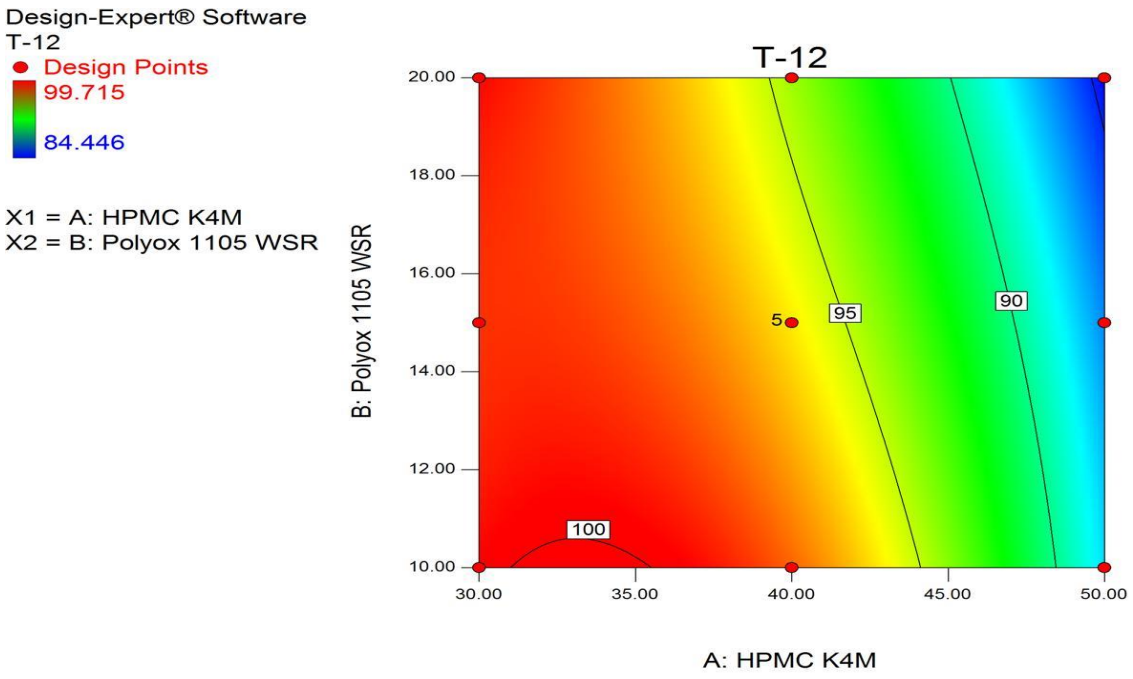

Fig.6: Contour plot showing the influence of HPMC K4M and Polyox WSR 1105 on drug release at 12th hour

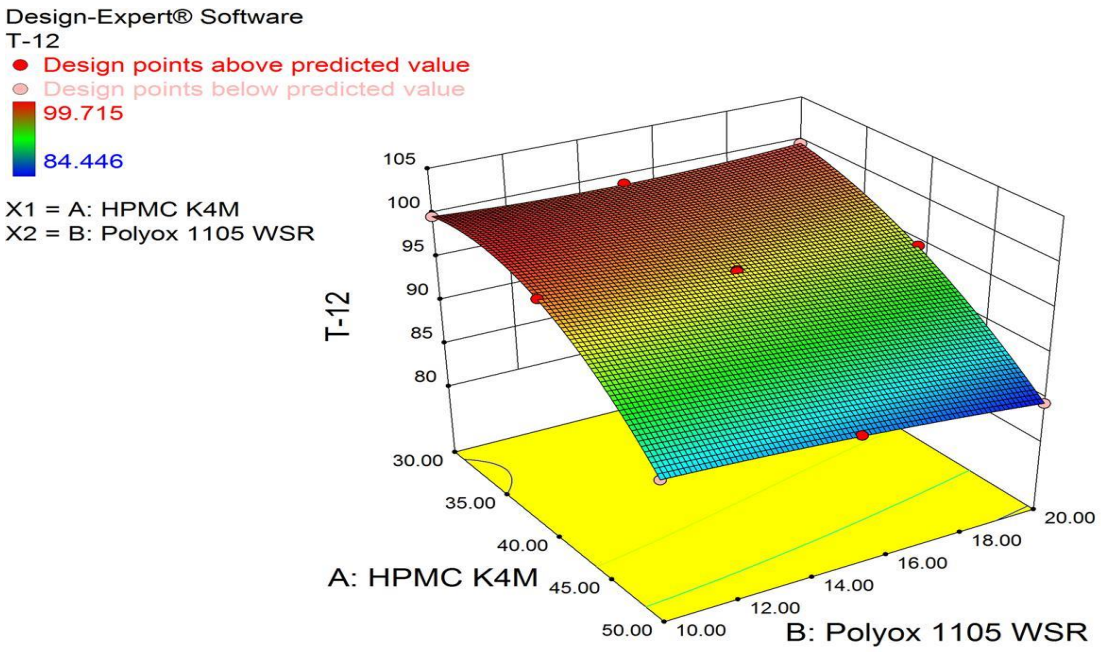

Fig.7: Response surface plot showing the influence of HPMC K4M and Polyox WSR 1105 on drug release at 12th hour

Evaluation of tablets of optimized batch

The tablets of the final optimized batch were subjected to various evaluation tests like weight variation, hardness, friability, thickness, length, floating lag time, drug content and in vitro dissolution study as shown in the following table 9.

Table 8: Evaluation parameters of the tablet of optimized batch

Final Batch	**Hardness (kg/cm²)**	**Friability (%)**	**Weight Variation (mg)**	**The thickness of tablets (mm)**	**FLT (sec)**	**Length (mm)**	**Drug Content (%)**
OF-A	4.5 ± 0.200	0.32	250.3 ± 0.577	3.10 ± 0.100	140	9.1±0.04	98.67

Validation of results

For the final formulation, the results of the physical evaluation were found to be within limits. Table 11 lists the composition of the final batch, its predicted and experimental values of all the response variables and the percentage error.

Table 9: Composition of the OF-A, the predicted and experimental values of response variables, and percentage prediction error

Composition HPMC K4M: Polyox WSR 1105 (%)	**Response Variable**	**Experimental Value**	**Predicted Value**	**Percentage Error (%)**
30:20	FLT	127.7	124.569	+2.458
	% Drug release at 1st hour	28.092	29.4109	+4.691
	% Drug release at 12th hour	99.134	99.635	+0.505

Swelling index

Swelling is a vital factor to ensure buoyancy of prepared tablets. Both Polyox WSR 1105 and HPMC K4M are hydrophilic polymers. They swell in contact with water. HPMC shows a slow and continuous volume increase. On the other hand, Polyox WSR 1105 swells rapidly, but these polymers form a weaker gel, tend to erode much more quickly and cause tablet volume decrease progressively.

Scanning Electron Microscopy (SEM)

The surface and cross-sectional SEM images of the buoyant tablet were taken before and after dissolution studies as shown in Figures 8 and 9.

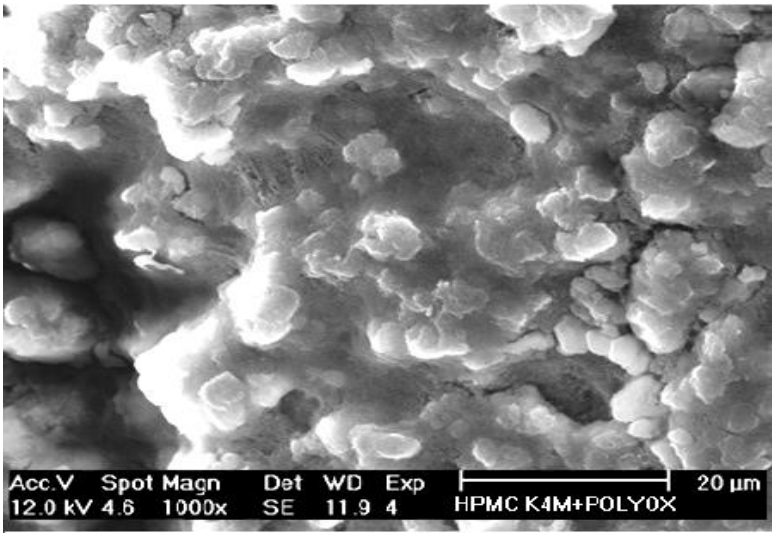

Fig. 8: SEM photomicrograph of OF-A before dissolution

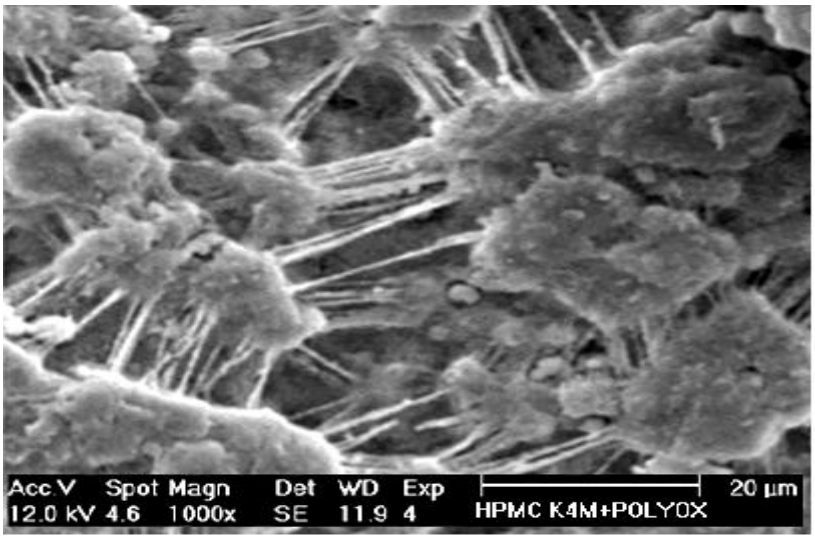

Fig. 9: SEM photomicrograph of OF-A after 8 hours of dissolution

CONCLUSION

The study was aimed at the preparation of gastro-retentive tablets of salbutamol sulphate. A longer gastric residence time is an important condition for higher bioavailability of the drugs included in the prolonged or controlled-release dosage forms. Promising controlled-release floating tablets of salbutamol sulphate were successfully formulated by effervescent technique. The effervescent-based floating drug delivery was a promising approach to achieving in vitro buoyancy. The addition of gel-forming polymer HPMC K4M, Polyox WSR 1105 and gas-generating agent sodium bicarbonate was to achieve in vitro buoyancy. Tablets showed satisfactory results with respect to floating lag time, total floating duration, swelling ability and sustained drug release rates. Powdered X-ray diffusion studies also showed that there was little loss in the crystallinity of the drug upon direct compression. Based on the above conclusions, it has been revealed that floating type gastro retentive drug delivery system holds significant potential for better drug delivery of various therapeutics moieties.

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