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FORMULATION AND IN VITRO CHARACTERISATION OF BUPROPION LOADED FLOATING TABLETS BY EMPLOYING EFFERVESCENT METHOD

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ABSTRACT

In the present research work gastro retentive floating matrix formulation of Bupropion by using various polymers were developed. Initially analytical method development was done for the drug molecule. Absorption maxima was determined based on that calibration curve was developed by using different concentrations. Gas generating agent sodium bicarbonate concentration was optimised. Then the formulation was developed by using different concentrations of polymers Guar gum, Xanthan gum and Chitosan as polymeric substances. The formulation blend was subjected to various preformulation studies, flow properties and all the formulations were found to be good indicating that the powder blend has good flow properties. Among all the formulations the formulations Xanthan gum as polymer were retarded the drug release for 12 hours. Where as in high concentrations the polymer was unable to produce the desired action. The formulations prepared with Xanthan gum were also retarded the drug release up to 12 hours (F5=99.83%). The optimised formulation dissolution data was subjected to release kinetics; from the release kinetics data it was evident that the formulation followed Kors mayer peppas release kinetics mechanism of drug release.

KEYWORDS: Bupropion, Guar gum, Xanthan gum and Chitosan, Floating Tablets.

INTRODUCTION

Gastric emptying of dosage forms is an extremely variable process and ability to prolong and control the emptying time is a valuable asset for dosage forms, which reside in the stomach for a longer period of time than conventional dosage forms. Several difficulties are faced in designing controlled release systems for better absorption and enhanced bioavailability. One of such difficulties is the inability to confine the dosage form in the desired area of the gastrointestinal tract. Drug absorption from the gastrointestinal tract is a complex procedure and is subject to many variables. It is widely acknowledged that the extent of gastrointestinal tract drug absorption is related to contact time with the small intestinal mucosa.[1] Thus, small intestinal transit time is an important parameter for drugs that are incompletely absorbed. Basic human physiology with the details of gastric emptying, motility patterns, and physiological and formulation variables affecting the cosmic emptying are summarized. Gastroretentive systems can remain in the gastric region for several hours and hence significantly prolong the gastric residence time of drugs. Prolonged gastric retention improves bioavailability, reduces drug waste, and improves solubility for drugs that are less soluble in a high pH environment. It has applications also for local drug delivery to the stomach and proximal small intestines. Gastro retention helps to provide better availability of new products with new therapeutic possibilities and substantial benefits for patients. The controlled gastric retention of solid dosage forms may be achieved by the mechanisms of mucoadhesion,[2,3] flotation,4 sedimentation,[5,6] expansion,[7,8] modified shape systems,[9,10] or by the simultaneous administration of pharmacological agents[11,12] that delay gastric emptying. Based on these approaches, classification of floating drug delivery systems (FDDS) has been described in detail. In vivo/in vitro evaluation of FDDS has been discussed by scientists to assess the efficiency and application of such systems. Several recent examples have been reported showing the efficiency of such systems for drugs with bioavailability problems.

Bupropion is an atypical antidepressant primarily used to treat major depressive disorder and to support smoking cessation. Bupropion is an effective antidepressant on its own, but it is also popular as an add-on medication in the cases of incomplete response to the first-line selective serotonin reuptake inhibitor (SSRI) antidepressant.

The aim of the present work is to formulate & evaluate gastro retentive floating tablets of Bupropion using

various polymers. The gastro retentive drug delivery systems can be retained in the stomach and assist in improving the oral sustained delivery of drugs that have an absorption window in a particular region of gastrointestinal tract. These systems help in continuously releasing the drug before it reaches the absorption window, thus ensuring optimal bioavailability.

In the present investigation floating tablets of Bupropion were prepared by direct compression using various polymers.

MATERIALS AND METHODS

Materials: Bupropion Procured from GlaxoSmithKline. Provided by SURA LABS, Dilsukhnagar, Hyderabad. Guar gum, Xanthan gum, Chitosan from Richer pharmaceuticals Hyderabad, India. Sodium bicarbonate purchased from Laser Chemicals, Ahmedabad, India.

Methodology

Analytical method development

a) Determination of absorption maxima

A solution containing the concentration 10 µg/ mL drug was prepared in 0.1N HCL UV spectrum was taken using Double beam UV/VIS spectrophotometer. The solution was scanned in the range of 200 – 400 nm.

b) Preparation calibration curve

10mg Bupropion pure drug was dissolved in 10ml of methanol (stock solution1) from stock solution 1ml of solution was taken and made up with10ml of 0.1N HCL (100µg/ml). From this 1ml was taken and made up with 10 ml of 0.1N HCL (10µg/ml). The above solution was subsequently diluted with 0.1N HCL to obtain series of dilutions Containing 5, 10, 15, 20, 25 µg /ml of per ml of solution. The absorbance of the above dilutions was measured at 253 nm by using UV-Spectrophotometer taking 0.1N HCL as blank. Then a graph was plotted by taking Concentration on X-Axis and Absorbance on Y-Axis which gives a straight line Linearity of standard curve was assessed from the square of correlation coefficient (R^2) which determined by least-square linear regression analysis.

Preformulation parameters

The quality of tablet, once formulated by rule, is generally dictated by the quality of physicochemical properties of blends. There are many formulations and process variables involved in mixing and all these can affect the characteristics of blends produced. The various characteristics of blends tested as per Pharmacopoeia.

Angle of repose

The frictional force in a loose powder can be measured by the angle of repose. It is defined as, the maximum angle possible between the surface of the pile of the powder and the horizontal plane. If more powder is added to the pile, it slides down the sides of the pile until the mutual friction of the particles producing a surface angle, is in equilibrium with the gravitational force. The fixed funnel method was employed to measure the angle of repose. A funnel was secured with its tip at a given height (h), above a graph paper that is placed on a flat horizontal surface. The blend was carefully pored through the funnel until the apex of the conical pile just touches the tip of the funnel. The radius (r) of the base of the conical pile was measured. The angle of repose was calculated using the following formula:

$\tan \theta = h / r$ $\tan \theta$ = Angle of repose

h = Height of the cone, r = Radius of the cone base

Table 1: Angle of Repose values (as per USP).

Angle of Repose	Nature of flow
<25	Excellent
25-30	Good
30-40	Passable
>40	Very poor

Bulk density

Density is defined as weight per unit volume. Bulk density, is defined as the mass of the powder divided by the bulk volume and is expressed as gm/cm^3. The bulk density of a powder primarily depends on particle size distribution, particle shape and the tendency of particles to adhere together. Bulk density is very important in the size of containers needed for handling, shipping, and storage of raw material and blend. It is also important in size blending equipment. 10 gm powder blend was sieved and introduced into a dry 20 ml cylinder, without compacting. The powder was carefully leveled without compacting and the unsettled apparent volume, Vo, was read.

The bulk density was calculated using the formula:

Bulk Density = M / V_o

Where, M = weight of sample

V_o = apparent volume of powder

Tapped density

After carrying out the procedure as given in the measurement of bulk density the cylinder containing the sample was tapped using a suitable mechanical tapped density tester that provides 100 drops per minute and this was repeated until difference between succeeding measurement is less than 2 % and then tapped volume, V measured, to the nearest graduated unit. The tapped density was calculated, in gm per L, using the formula:

Tap = M / V

Where, Tap= Tapped Density

M = Weight of sample

V= Tapped volume of powder

Measures of powder compressibility

The Compressibility Index (Carr's Index) is a measure of the propensity of a powder to be compressed. It is determined from the bulk and tapped densities. In theory, the less compressible a material the more flowable it is. As such, it is measures of the relative importance of interparticulate interactions. In a free- flowing powder, such interactions are generally less significant, and the bulk and tapped densities will be closer in value.

For poorer flowing materials, there are frequently greater interparticle interactions, and a greater difference between the bulk and tapped densities will be observed. These differences are reflected in the Compressibility Index which is calculated using the following formulas:
Carr's Index = [(tap - b) / tap] × 100
Where, b = Bulk Density
Tap = Tapped Density

Table 2: Carr's index value (as per USP).

Carr's index	Properties
5 – 15	Excellent
12 – 16	Good
18 – 21	Fair to Passable
2 – 35	Poor
33 – 38	Very Poor
>40	Very Very Poor

Formulation development of floating Tablets:
For optimization of sodium bicarbonate concentration, granules were prepared by direct compression method.
Procedure for direct compression method:

1) Drug and all other ingredients were individually passed through sieve no ≠ 60.
2) All the ingredients were mixed thoroughly by triturating up to 15 min.
3) The powder mixture was lubricated with talc.
4) The tablets were prepared by using direct compression method by using 10 mm punch.

Formulation of tablets

Table 3: Formulation composition for floating tablets.

Ingredients	Formulation chart											
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
Bupropion	150	150	150	150	150	150	150	150	150	150	150	150
Guar gum	40	80	120	160	-	-	-	-	-	-	-	-
Xanthan gum	-	-	-	-	40	80	120	160	-	-	-	-
Chitosan	-	-	-	-	-	-	-	-	40	80	120	160
Sodium bicarbonate	30	30	30	30	30	30	30	30	30	30	30	30
Aerosil	4	4	4	4	4	4	4	4	4	4	4	4
Mg Stearate	5	5	5	5	5	5	5	5	5	5	5	5
Lactose	171	131	91	51	171	131	91	51	171	131	91	51
Total weight	400	400	400	400	400	400	400	400	400	400	400	400

All the quantities were in mg

Evaluation of post compression parameters for prepared Tablets
The designed compression tablets were studied for their physicochemical properties like weight variation, hardness, thickness, friability and drug content.

Weight variation test:
To study the weight variation, twenty tablets were taken and their weight was determined individually and collectively on a digital weighing balance. The average weight of one tablet was determined from the collective weight. The weight variation test would be a satisfactory method of deter mining the drug content uniformity. Not more than two of the individual weights deviate from the average weight by more than the percentage shown in the following table and none deviate by more than twice the percentage. The mean and deviation were determined. The percent deviation was calculated using the following formula.
% Deviation = (Individual weight – Average weight / Average weight) × 100

Table 4: Pharmacopoeial specifications for tablet weight variation.

Average weight of tablet (mg) (I.P)	Average weight of tablet (mg) (U.S.P)	Maximum percentage difference allowed
Less than 80	Less than 130	10
80-250	130-324	7.5
More than	More than 324	5

Hardness
Hardness of tablet is defined as the force applied across the diameter of the tablet in order to break the tablet. The resistance of the tablet to chipping, abrasion or breakage under condition of storage transformation and handling before usage depends on its hardness. For each

formulation, the hardness of three tablets was determined using Monsanto hardness tester and the average is calculated and presented with deviation.

Thickness

Tablet thickness is an important characteristic in reproducing appearance. Tablet thickness is an important characteristic in reproducing appearance. Average thickness for core and coated tablets is calculated and presented with deviation.

Friability

It is measured of mechanical strength of tablets. Roche friabilator was used to determine the friability by following procedure. Pre weighed tablets were placed in the friabilator. The tablets were rotated at 25 rpm for 4 minutes (100 rotations). At the end of test, the tablets were re- weighed, and loss in the weight of tablet is the measure of friability and is expressed in percentage as

% Friability = [(W1-W2) / W1] × 100

Where, W1 = Initial weight of tablets

W2 = Weight of the tablets after testing

Determination of drug content

Both compression-coated tablets of were tested for their drug content. Ten tablets were finely powdered quantities of the powder equivalent to one tablet weight of Bupropion were accurately weighed, transferred to a 100 ml volumetric flask containing 50 ml water and were allowed to stand to ensure complete solubility of the drug. The mixture was made up to volume with water. The solution was suitably diluted and the absorption was determined by UV –Visible spectrophotometer. The drug concentration was calculated from the calibration curve.

***In vitro* buoyancy studies**

The *in vitro* buoyancy was determined by floating lag time, and total floating time. (As per the method described *by Rosa et al*) The tablets were placed in a 100ml beaker containing 0.1N HCL. The time required for the tablet to rise to the surface and float was determined as floating lag time (FLT) and duration of time the tablet constantly floats on the dissolution medium was noted as Total Floating Time respectively (TFT).

In vitro drug release studies

Dissolution parameters

Apparatus - USP-II, Paddle Method

Dissolution Medium - 0.1 N HCL

RPM - 50

Sampling intervals (hrs) - 0.5,1,2,3,4,5,6,7,8,9,10,11,12

Temperature - 37°c $\pm$ 0.5°c

As the preparation was for floating drug release given through oral route of administration, different receptors fluids are used for evaluation the dissolution profile.

Procedure

900ml 0f 0.1 HCL was placed in vessel and the USP apparatus –II (Paddle Method) was assembled. The medium was allowed to equilibrate to temp of 37°c $\pm$ 0.5°c. Tablet was placed in the vessel and the vessel was covered the apparatus was operated for 12 hours and then the medium 0.1 N HCL was taken and process was continued from 0.5 to 12hrs at 50 rpm. At definite time intervals of 5 ml of the receptors fluid was withdrawn, filtered and again 5ml receptor fluid was replaced. Suitable dilutions were done with media and analyzed by spectrophotometrically at 253 nm using UV-spectrophotometer.

Application of release rate kinetics to dissolution data

Various models were tested for explaining the kinetics of drug release. To analyze the mechanism of the drug release rate kinetics of the dosage form, the obtained data were fitted into zero-order, first order, Higuchi, and Korsmeyer-Peppas release model.

Zero order release rate kinetics

To study the zero–order release kinetics the release rate data ar e fitted to the following equation.

$F = K_o t$

Where, 'F' is the drug release at time't', and 'K_o' is the zero order release rate constant. The plot of % drug release versus time is linear.

First order release rate kinetics: The release rate data are fitted to the following equation

Log (100-F) = kt

A plot of log cumulative percent of drug remaining to be released vs. time is plotted then it gives first order release.

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

F = k t1/2

Where, 'k' is the Higuchi constant.

In higuchi model, a plot of % drug release versus square root of time is linear.

Korsmeyer and Peppas release model:

The mechanism of drug release was evaluated by plotting the log percentage of drug released versus log time according to Korsmeyer- Peppas equation. The exponent 'n' indicates the mechanism of drug release calculated through the slope of the straight Line.

$M_t / M_\infty = K t^n$

Where, M_t / M_∞ is fraction of drug released at time 't', k represents a constant, and 'n' is the diffusional exponent, which characterizes the type of release mechanism during the dissolution process. For non-Fickian release, the value of n falls between 0.5 and 1.0; while in case of Fickian diffusion, n = 0.5; for zero-order release (case I I transport), n=1; and for supercase II transport, n > 1. In this model, a plot of log (M_t / M_∞) versus log (time) is linear.

Drug – Excipient compatibility studies

Fourier Transform Infrared (FTIR) spectroscopy:
The compatibility between the pure drug and excipients was detected by FTIR spectra obtained on Bruker FTIR Germany(Alpha T).The solid powder sample directly place on yellow crystal which was made up of ZnSe. The spectra were recorded over the wave number of 4000 cm^{-1} to 550 cm^{-1}.

RESULTS AND DISCUSSION

Analytical Method

A. Determination of absorption maxima

The standard curve is based on the spectrophotometry. The maximum absorption was observed at 253 nm.

B. Calibration curve

Graphs of Bupropion was taken in 0.1N HCL (pH 1.2)

Table 5: Observations for graph of Bupropion in 0.1N HCl.

Conc [µg/mL]	Abs
0	0
5	0.139
10	0.248
15	0.374
20	0.478
25	0.591

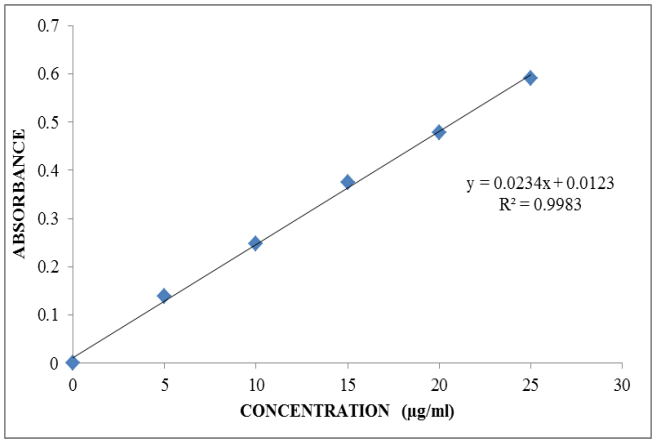

Fig. 1: Standard graph of Bupropion in 0.1N HCL.

Standard graph of Bupropion was plotted as per the procedure in experimental method and its linearity is shown in Table 8.1 and Fig 8.1. The standard graph of Bupropion showed good linearity with R^2 of 0.998, which indicates that it obeys "Beer- Lamberts" law.

Preformulation parameters of powder blend

Table 6: Pre-formulation parameters of blend.

Formulation Code	Angle of Repose	Bulk density (gm/mL)	Tapped density (gm/mL)	Carr's index (%)	Hausner's Ratio
F1	18.8	0.38	0.43	11.6	1.13
F2	19.6	0.39	0.44	11.3	1.12
F3	19.4	0.42	0.47	10.6	1.11
F4	21.9	0.40	0.45	11.1	1.12
F5	17.5	0.41	0.46	10.8	1.12
F6	19.2	0.37	0.43	13.9	1.16
F7	19.5	0.38	0.46	17.3	1.21
F8	21.3	0.39	0.45	13.3	1.15
F9	20.1	0.41	0.45	8.8	1.09
F10	19.6	0.41	0.47	12.7	1.14
F11	20.1	0.41	0.46	12.1	1.12
F12	21.5	0.40	0.47	14.89	1.17

Tablet powder blend was subjected to various pre-formulation parameters. The angle of repose values indicates that the powder blend has good flow properties. The bulk density of all the formulations was found to be in the range of 0.37 to 0.42 (gm/ml) showing that the powder has good flow properties. The tapped density of all the formulations was found to be in the range of 0.43 to 0.47 showing the powder has good flow properties. The compressibility index of all the formulations was found to be below 17.3 which show that the powder has

good flow properties. All the formulations has shown the hausners ratio ranging between 1.09 to 1.21 indicating the powder has good flow properties.

Quality Control Parameters For tablets:

Tablet quality control tests such as weight variation, hardness, and friability, thickness, Drug content and drug release studies were performed for floating tablets.

Table 7: In vitro quality control parameters.

Formulation codes	Average Weight (mg)	Hardness (kg/cm^2)	Friability (%loss)	Thickness (mm)	Drug content (%)	Floating lag time (sec)	Total Floating Time(Hrs)
F1	400.26	4.8	0.19	4.25	97.59	28	8
F2	399.59	4.9	0.28	4.72	99.35	46	7
F3	400.03	4.2	0.85	4.36	98.52	31	10
F4	398..75	4.6	0.64	4.91	95.29	56	6
F5	396.89	4.2	0.38	4.86	97.36	20	12
F6	398.92	4.9	0.75	4.17	99.56	37	12
F7	397.57	4.7	0.29	4.38	98.15	26	8
F8	399.38	4.5	0.48	4.51	99.33	43	12
F9	397.22	4.2	0.52	4.62	96.78	57	12
F10	399.79	4.6	0.37	4.38	98.42	26	9
F11	398.37	4.8	0.22	4.22	99.83	47	10
F12	397.88	4.4	0.37	4.37	97.92	28	8

All the parameters such as weight variation, friability, hardness, thickness, drug content were found to be within limits.

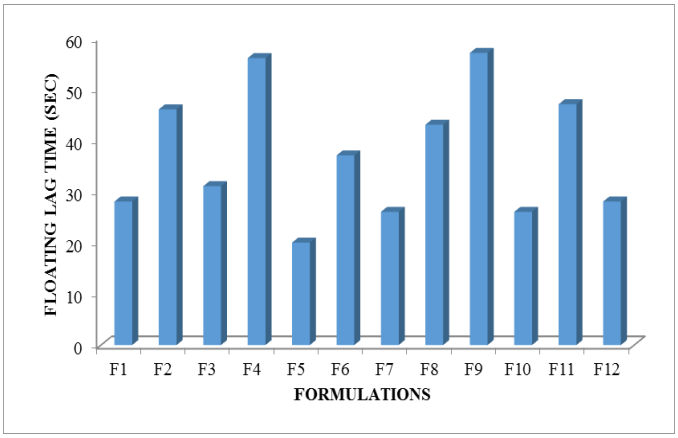

Fig. 2: Floating lag time (sec).

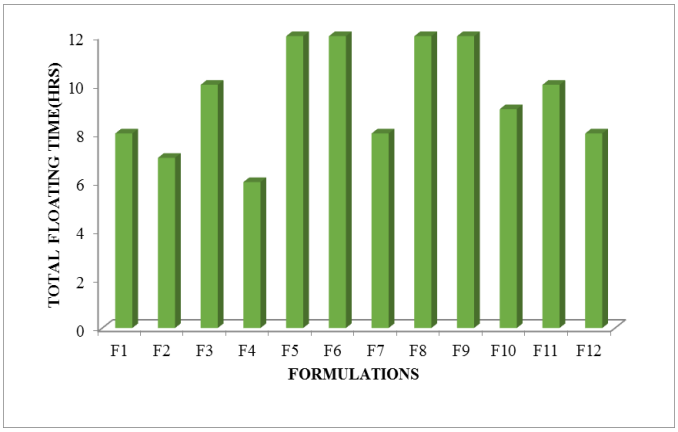

Fig. 3: Total Floating Time (Hrs).

Table 8: In vitro drug release studies.

Time	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
0	0	0	0	0	0	0	0	0	0	0	0	0
1	14.62	10.58	13.72	10.41	12.52	8.39	7.19	10.96	12.38	8.36	9.39	6.35
2	19.68	15.64	18.14	16.34	17.37	16.17	19.72	14.83	18.29	14.49	19.75	13.92

3	25.64	27.11	25.76	21.92	27.48	25.35	23.93	21.78	23.71	26.38	26.31	18.72
4	31.48	38.97	35.10	28.76	42.26	36.17	29.54	27.41	32.92	34.97	32.68	28.92
5	36.95	45.65	46.28	33.63	54.18	48.86	35.41	35.79	38.49	48.11	48.97	34.89
6	48.72	52.74	55.19	45.21	58.71	56.61	39.76	41.86	46.58	53.38	57.45	47.22
7	59.39	64.22	64.98	49.34	66.33	69.14	56.19	47.31	58.26	65.15	65.53	53.81
8	63.14	75.94	69.75	57.27	75.85	75.59	64.72	53.22	69.15	74.59	72.97	59.78
9	67.58	84.19	74.15	68.34	83.95	83.61	67.29	61.89	76.87	78.67	75.32	63.75
10	74.11	88.76	79.37	73.27	86.78	85.34	72.34	67.15	84.62	82.98	82.47	69.18
11	80.64	92.36	85.48	81.54	90.15	89.23	76.52	72.93	88.48	87.35	85.59	73.82
12	98.96	95.15	91.86	87.12	99.83	92.45	84.42	76.42	94.12	90.24	87.67	78.49

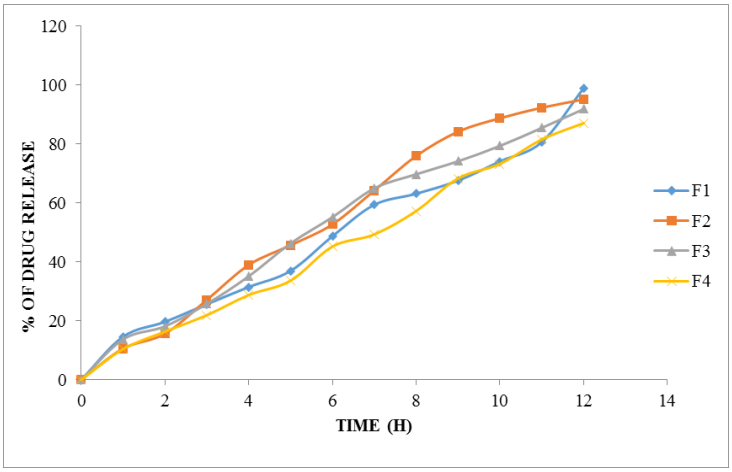

Fig. 4: Dissolution data of bupropion floating tablets containing guar gum.

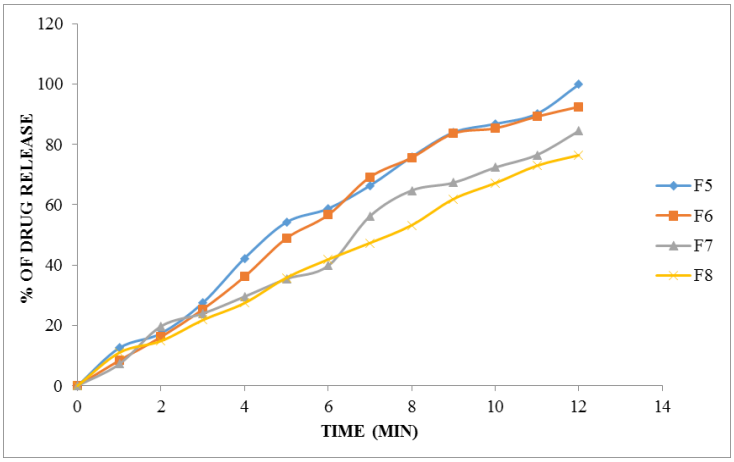

Fig. 5: Dissolution data of bupropion Floating tablets containing xanthan gum.

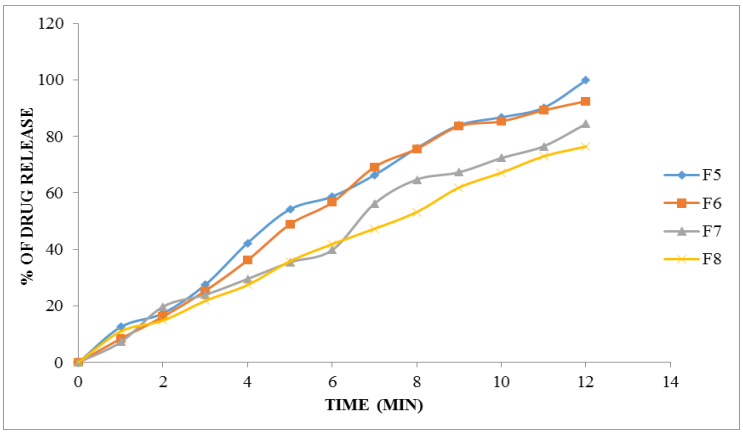

Fig. 6: Dissolution data of bupropion floating tablets containing chitosan.

From the dissolution data it was evident that the formulations prepared with Guar gum as polymer were retarded the drug release more than 12 hours.

Whereas the formulations prepared with Xanthan gum retarded the drug release up to 12 hours in the concentration 40 mg. In higher concentrations the polymer was unable to retard the drug release.

From the dissolution data, it was revealed that formulations prepared with Chitosan retard the drug release up to 12 hrs.

Hence from the above dissolution data it was concluded that F5 formulation was considered as optimised formulation because good drug release (99.83%) in 12 hours.

Application of Release Rate Kinetics to Dissolution Data for optimised formulation:

Table No. 9: Application kinetics for optimised formulation.

Cumulative (%) release q	Time (T)	Root (T)	Log (%) release	LOG (T)	LOG (%) remain	Release rate (Cumulative % release / t)	1/ CUM% Release	Peppas log Q/ 100	% Drug remaining	Q01/3	Qt1/ 3	Q01/3-Qt1/3
0	0	0			2.000				100	4.642	4.642	0.000
12.52	1	1.000	1.098	0.000	1.942	12.520	0.0799	-0.902	87.48	4.642	4.439	0.202
17.37	2	1.414	1.240	0.301	1.917	8.685	0.0576	-0.760	82.63	4.642	4.356	0.286
27.48	3	1.732	1.439	0.477	1.860	9.160	0.0364	-0.561	72.52	4.642	4.170	0.471
42.26	4	2.000	1.626	0.602	1.761	10.565	0.0237	-0.374	57.74	4.642	3.865	0.777
54.18	5	2.236	1.734	0.699	1.661	10.836	0.0185	-0.266	45.82	4.642	3.578	1.063
58.71	6	2.449	1.769	0.778	1.616	9.785	0.0170	-0.231	41.29	4.642	3.456	1.185
66.33	7	2.646	1.822	0.845	1.527	9.476	0.0151	-0.178	33.67	4.642	3.229	1.412
75.85	8	2.828	1.880	0.903	1.383	9.481	0.0132	-0.120	24.15	4.642	2.890	1.751
83.95	9	3.000	1.924	0.954	1.205	9.328	0.0119	-0.076	16.05	4.642	2.522	2.119
86.78	10	3.162	1.938	1.000	1.121	8.678	0.0115	-0.062	13.22	4.642	2.365	2.277
90.15	11	3.317	1.955	1.041	0.993	8.195	0.0111	-0.045	9.85	4.642	2.144	2.498
99.83	12	3.464	1.999	1.079	-0.770	8.319	0.0100	-0.001	0.17	4.642	0.554	4.088

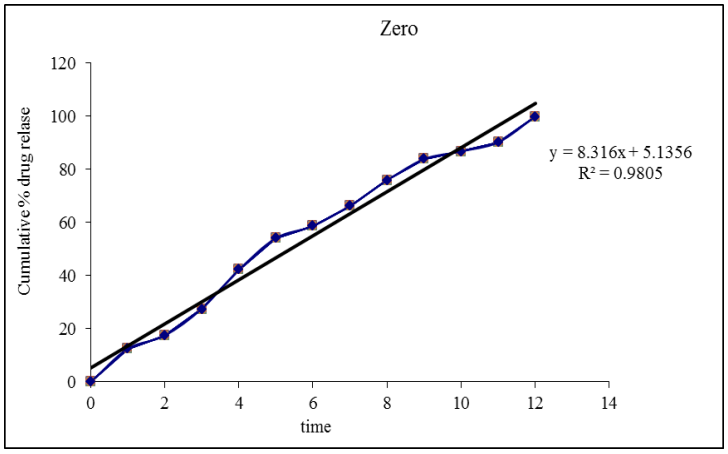

Fig. 7: Zero order release kinetics.

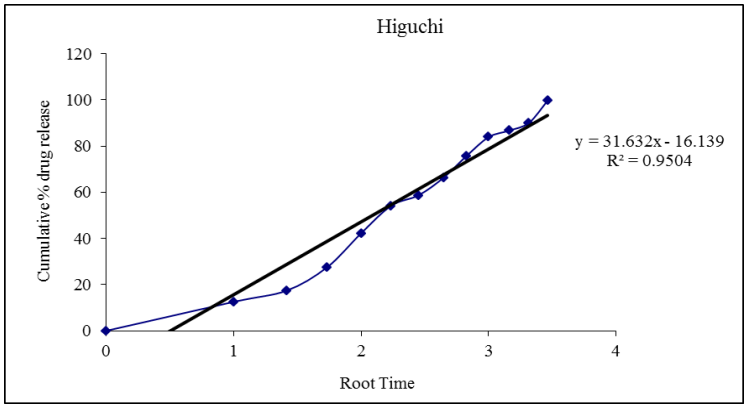

Fig. 8: Higuchi release kinetics.

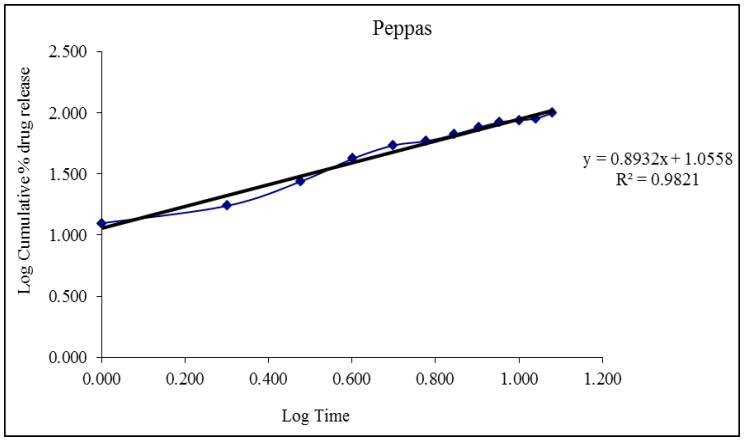

Fig. 9 : Kors mayer peppas release kinetics.

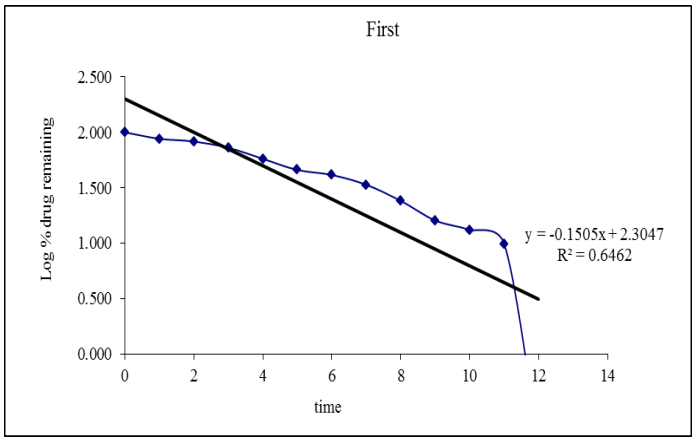

Fig. 10: First order release kinetics

Optimised formulation F5 was kept for release kinetic studies. From the above graphs it was evident that the formulation F5 was followed Kors mayer peppas release kinetics mechanism.

Drug – Excipient compatibility studies

Fourier Transform-Infrared Spectroscopy:

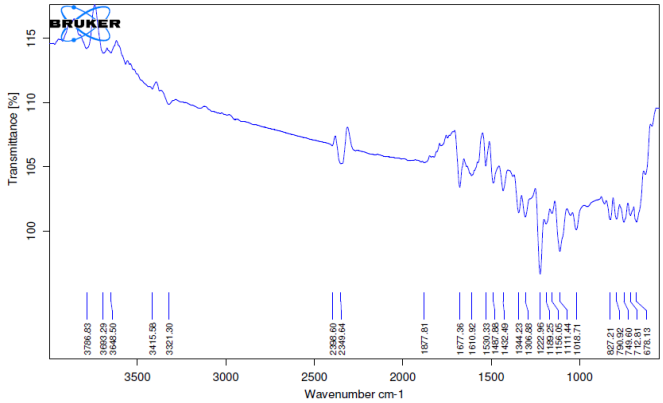

Fig. 11: FTIR Spectrum of pure drug.

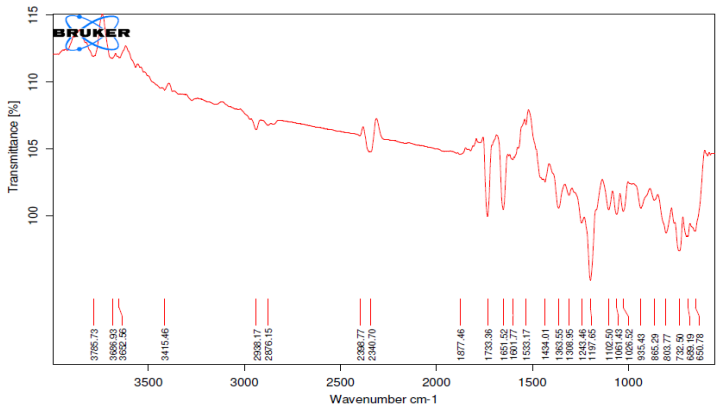

Fig. 12: FTIR Spectrum of optimised formulation.

There was no disappearance of any characteristics peak in the FTIR spectrum of drug and the polymers used. This shows that there is no chemical interaction between the drug and the polymers used. The presence of peaks at the expected range confirms that the materials taken for the study are genuine and there were no possible interactions.

Bupropion is also present in the physical mixture, which indicates that there is no interaction between drug and the polymers, which confirms the stability of the drug.

CONCLUSION

Development of Gastro retentive floating drug delivery of Bupropion tablets is to provide the drug action up to 12 hours.

Gastro retentive floating tablets were prepared by direct compression method using various polymers like Guar gum, Xanthan gum, Chitosan.

The formulated gastro retentive floating tablets were evaluated for different parameters such as drug Excipient compatibility studies, weight variation, thickness, hardness, content uniformity, *In vitro* Buoyancy studies, *In vitro* drug release studies performed in 0.1N HCL for 12 hrs and the data was subjected to zero order, first order, Higuchi release kinetics and karsmayer peppas graph.

The following conclusions could be drawn from the results of various experiments

- ✓ FTIR studies concluded that there was no interaction between drug and excipients.
- ✓ The physico-chemical properties of all the formulations prepared with different polymers Guar gum, Xanthan gum and Chitosan were shown to be within limits.
- ✓ Quality control parameters for tablets such as weight variation, Hardness, Friability, thickness, drug content and floating lag time were found to be within limits.
- ✓ *In vitro* drug release studies were carried out for all prepared formulation and from that concluded F5 formulation has shown good results.
- ✓ Finally concluded release kinetics to optimised formulation (F5) has followed Kors mayer peppas release kinetics mechanism.
- ✓ Present study concludes that gastro retentive floating system may be a suitable method for Bupropion.

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