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ORIGINAL ARTICLE

Formulation and Evaluation of Bilayer Tablet Containing Tramadol as Sustained Release and Aloe Vera Gel Powder as Immediate Release

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ABSTRACT
The objective of present study is to formulate and evaluate Bilayer tablet containing tramadol as sustained release layer and Aloe Vera is immediate release layer. Long term use of tramadol found to be negative impact on various organ of body such as a testies,ovaries and also cause constipation so combination of Aloe Vera gel powder reduce the side effect of tramadol. Aloe Vera gel powder help to healing of testicular tissue and also increase testosterone level, and positive impact on constipation by increasing fluid in intestine Bilayer tablet was prepared by using direct compression technique, The sustained release layer of tramdaol was formulated by using HPMC K15, HPMC K4 controlled release polymer. immediate release layer of Aloe Vera gel powder was formulated by using various excipient such as crospovidone , starch, talc, lactose etc. various preformulation parameter such a organoleptic characteristics was checked. micromeritics properties of both layer powder such as a bulk density, tapped density, Hausners, Ratio, Carŕs Index, Angle Of Repose are performed. Post compression evaluation parameter was checked such as hardness, friability, weight variation, drug content uniformity, thickness, in vitro drug release of all batches was found in range of 71.25 to 90.33 within 8hr.Bilayer tablet of optimized batch of both layers (A2, T1). Optimized batch of both layer showed satisfactory result for different evaluation parameter. The optimized formula contain of immediate release layer A2 (crospovidone) batch and sustained release layer of T1 (HPMC k4M) batch. The drug release mechanism was found to be zero order release found to be diffusion
Keywords: *Bilayer Tablet, Tramadol, Aloe Vera Gel Powder, HPMC K15, K4M, Immediate Release, Direct Compression, Sustained Release.*

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INTRODUCTION

The purpose of any drug delivery system is to supply a therapeutic quantity of the drug to the proper site of action in the body to maintain the desired drug concentration. Oral rout is most suitable route of the administration dosage form. Tablet is a convenient dosage form acceptable by patients and medical practitioner. Bilayer tablet is suitable for sequential release of two drugs in single dosage form which one is immediate release and another is sustained release. [1]

Single dosage form containing two different category drugs. The benefit of combination therapy to reduce the number of the dosage form in prescription and maintain administrative cost as well as improving patient compliance.[2]

Tramadol is an opioid analgesic and SNRI (serotonin/nor epinephrine reuptake-inhibitor) mechanism of action by centrally acting and structurally similar to codeine and morphine. Tramadol is used to treat Acute, moderate, severe Pain, Moderate Pain, Acute Premature, Ejaculation, Severe Pain, The primary mechanism of Tramadol is a centrally acting μ-opioid receptor agonist and it also SNRI (serotonin/ nor-epinephrine reuptake-inhibitor) that is structurally similar to codeine and morphine. Tramadol is rapidly

and almost completely absorbed by oral route, with a bioavailability of 75%. This difference in absorption and bioavailability can be attributed to the 20-30% first-pass metabolism. Peak plasma concentrations of tramadol shows by after two hrs and the primary metabolite M1 occur at three hours. Minimum effective concentration of tramadol is a 50mg [3]

Long term use of a tramadol can cause negative effect on various organs in body like ovary and testes and also cause constipation. administration of Aloe Vera with tramadol lower the side effect of tramadol it has antioxidant capacity it start healing of testicular tissue and it also has positive effect on testosterone level. Aloe Vera has a greater consequential effect on constipation. It increases the fluid in the intestine to soften the stools hence aloe Vera chooses for immediate release. [4]

Present study is to prepared Bilayer tablets of tramadol (Sustained Release) by using HPMC as controlled release polymer in sustained release layer along with other excipients and aloe Vera gel powder (Immediate release) using crosprovidone super disintegrant in an immediate release . [5] Tablet layer was manufactured separately using 8 station CREATE compression machine. To evaluate blends (powder) for pre-compression terms such as a of Angle of repose, Bulk and tapped density, Carr's index, Hausner's Ratio and to evaluate Bi-layer matrix tablets in terms of hardness, weight variation, friability, thickness, drug content uniformity, In vitro dissolution studies in 1.2 and 6.8 pH. [6]

MATERIAL AND METHODS

MATERIAL

Sample was gifted from Tramadol (Enaltec), HPMC K15M, Talc (ThermosilFine Chem.) Aloe Vera gel powder (Maple Biotech Pvt Ltd Bhosari, Pune, Maharashtra) Sodium Starch Glycolate, (Research Lab,Pune) Lactose, (Sahyadri Scientific Supply, Pune) Magnesium Stearate (HilabChemicals) and Starch, were Sample is Analytical Grade.

METHODOLOGY

Formulation of two layer tablet was prepared by using direct compression technique. Immediate release layer was prepared by using different super disintegrates (Crossprovidone). Drug and above super disintegrates were passed through the 40# sieve and transfer into polybag and mix up to 5 min. Then add remaining excipients to the above mixture. Then, add (glidant) talc into the blend. Another layer was also prepared by direct compression; drug and polymer (HPMC K15M)and other exicipent (except magnesium sterate) were pass through the 40# sieve transfer into polybag and mixed properly up to 5 min. Other excipients were mixed well and finally added Magnesium Sterate in the above powder and were mixed for 10 min. Finally, above optimized batch blends were compressed by Rotary Tablet Compression Machine (Make-CREATE INDUSTRIES, MODEL-LP8GMP) [6, 7].

Table 1 Formulation of immediate release layer of aloe Vera gel powder

Sr. No.	Ingredients	Weight (mg)		
		A1	A2	A3
1	Aloe Vera gel Powder	100	100	100
2	Crosprovidone	9	10	11
3	Starch	7	6	5
4	Lactose	29	29	29
5	Talc	5	5	5
6	Color	q. s	q. s	q. s
7	Total	150mg	150mg	150mg

Table 2:Formulation of sustained release Tramadol

Sr. No.	Ingredients	Weight (mg)					
		T1	T2	T3	T4	T5	T6
1	Tramadol	50	50	50	50	50	50
2	HPMC K4M	40	50	60	-	-	-
3	HPMC K15M	-	-	-	40	50	60
4	Lactose	37.5	27.5	17.5	37.5	27.5	17.5
5	Avicil 101	17	17	17	17	17	17
6	Talc	1.5	1.5	1.5	1.5	1.5	1.5
7	Magnesium stearate	4	4	4	4	4	4
8	Total	150mg	150mg	150mg	150mg	150mg	150mg

Preformulation study: [8, 9]

Identification test by UV-VIS. Spectrophotometer

For Tramadol:

50mg of Tramadol was weighed accurately and transferred it to 25 ml volumetric flask. Dissolved it in methanol: water (60:40) and make the volume up to 25 ml with respective solvent. This was considered a stock solution (1000 ppm). Further dilutions were made with this stock solution and scanned in the range of 400-200 nm using blank as a methanol in UV spectrophotometer (SHIMADZU U. V 1800).

For Aloe Vera gel powder

25mg Aloe Vera gel powder was weighed accurately weighed on weighing balance then transferred it to 25 ml volumetric flask. Dissolved it in methanol and make the volume up to 25 ml with respective solvent. This was considered a stock solution (1000 ppm). Further dilutions were made with this stock solution and scanned in the range of 400-200 nm using blank as a methanol in UV spectrophotometer.

Melting point determination

Melting point of tramadol and aloe Vera gel powder was determined by using melting point apparatus by capillary technique.

Determination of solubility [10]

Qualitative Solubility

Qualitative solubility analysis of drugs was done by dissolving 10 mg of drug in 10 ml solvent such as distilled water, methanol, ethanol, chloroform, and phosphate buffer (6.4), ether then finally we got solubility in methanol and water.

Compatibility study, by FT-IR spectroscopy [8]

The powdered substance of the tablet was mix; dried potassium bromide (IR grade) ratio of sample is should be 1:100 mg, i.e. 1 mg sample: 100 mg KBr. are compressed to form transparent pellets. The sample was scanned from 4000 to 400 cm-1at ambient temperature. (Perkin Elmer Spectrum-65)

Pre-compression evaluation [8]

Bulk density

Bulk density was calculated by introducing the power blend into measuring cylinder and the total volume was measured and also total powder weight was measured. The bulk density was calculated by using this formula.

Bulk density (BD) = weight of powder/bulk volume.

Tapped density

Tapped density was calculated by tapping the cylinder by using the tapped density apparatus. Tapped the cylinder up to 100 times and then measure the tapped volume and calculate the tapped density by using following formula.

Tapped Density (TD) = weight of powder/tapped volume.

Hausner's ratio

Hausner's ratio bulk density as to tap density is the number that is compared to the flow ability of a powder or powder blend. It is calculated using formula,

Hausner's ratio = tapped density/bulk density.

Compressibility index

Compressibility index was calculated by formula,

Carr's index (%) = Tapped density–bulk density/tapped density* 100

Angle of repose The angle of repose of powder blend of each layer of each formulation was determined by fix funnel technique. The blend was passed through funnel separately until apex of pile so formed just touch the tip of the funnel. The angle of repose was calculated by using this formula

θ = tan-1h/r h is height of pile; r is the radius of pile.

Post-compression evaluation [5]

UNIFORMITY WEIGHT

Uniformity weight of the tablet was determined by selecting 20 tablets randomly. This selected tablet weighing individually and the weight of individual tablet was correlated with average weight.

Table 3:Limits for tablet weight variation test

Average weight of tablet (mg)	% Difference allowed
130 or less	10 %
From 130 to 324	7.5 %
>324	5%

THICKNESS

Thickness of the tablet was measured by using vernier caliper. 6 tablets were accurately selected and thickness was measured in unit (mm).

HARDNESS

The hardness of the tablet was calculated by using Monsanto hardness tester. The unit of hardness is calculated in term of kg/cm2.

FRIABILITY

The percentage friability was determined by the formula:

% friability = [initial weight–final weight/initial weight]*100

CONTENT UNIFORMITY

For Tramadol

10 tablets were taken and crushed into mortar and pestle to form a powder. From that, sample equivalent to 50 mg of drug was taken and transferred to 100 ml volumetric flask. Methanol: water (60:40) (20 ml) was added dissolve the drug and volume were made up to mark with methanol, this was filtered. From the filtrate 1 ml was taken and diluted with pH 6.8 phosphate buffer and absorbance of this solution was measured by using U. V-spectrophotometer at 271 nm (SHIMADZU; U. V1800).

For aloe Vera gel powder

10 tablets were taken and crushed into mortar by pestle to form a powder. From that, sample which contains 100 mg of drug was taken and transferred in to 100 ml volumetric flask. Methanol (20 ml) was added dissolve the drug and volume were made up to mark with methanol, this was filtered. From the filtrate 1 ml was taken and diluted with (pH 6.8 phosphate buffer) and absorbance of this solution was calculated by using U. V-spectrophotometer at 262 nm (SHIMADZU; U.V. 1800).

***IN VITRO* DRUG DISSOLUTION STUDIES**

In vitro drug release was studied for immediate release tablet (Aloe Vera gel powder)

In vitro drug release was studied using USP II (paddle) apparatus, (Electro lab TDT-08L) with 900 ml of dissolution medium maintained at 37±1 °C for 15 h, at 50 rpm. 0.1 N HCl (pH 1.2). 5 ml of sample was withdrawn after 10 min time intervals. The volume withdrawn at each interval was replaced with same quantity of fresh dissolution medium to maintain sink condition. Collected samples were analyzed by U. V spectrophotometrically at 262 nm, and cumulative percent drug release was calculated.

***In vitro* drug release was studied for sustained release tablet (Tramadol)**

The release of bilayer tablets was determined using USP Type II (Paddle) dissolution apparatus (Electro lab TDT-08L) under sink condition. The dissolution medium was 900 ml of a 0.1N HCl solution (pH=1.2), at 37 °C ±0.19c for 1hour. Then dissolution media replace by phosphate buffer (6.8pH). The stirring speed was 50 rpm. Aliquot of the solution was collected at the specific interval were replaced with fresh dissolution medium to maintain sink condition. The Aloe Vera gel powder and Tramadol were analyzed spectrophotometrically at 262 nm and 271 nm respectively using simultaneous equation method.

***In vitro* drug release was studied for Bilayer tablet**

In-Vitro dissolution study 15 the dissolution study was carried out first two hour in 0.1N HCl and another ten hour in 6.8pH phosphate buffer using USP -II dissolution test apparatus used. In this study one tablet containing 50 mg of tramadol was placed inside the 900 ml dissolution medium and speed of paddle was set at 50 rpm. Samples were (5ml) withdrawn at a particular time interval and same volume of fresh medium was replaced to maintain sink condition. The sample were analyzed for drug content against 0.1N HCl for first one hour and for another seven hour 6.8pH phosphate buffer (ph 1.2)as a blank at λ max 271 nm . The percentage drug release was plotted against time to determine the release profile.

RESULTS AND DISCUSSION

Pre-formulation studies [9,10]

The UV absorption of 100 ppm solution in methanol for Aloe Vera gel powder is 262 nm in the range of 200-400 nm exhibit maximum and in case of tramadol at 271 nm Fig 1, 2. Melting point, solubility and compatibility study of both drugs are carried out and the result is including in table 4.

Figure 1: Absorbance maxima of tramadol.

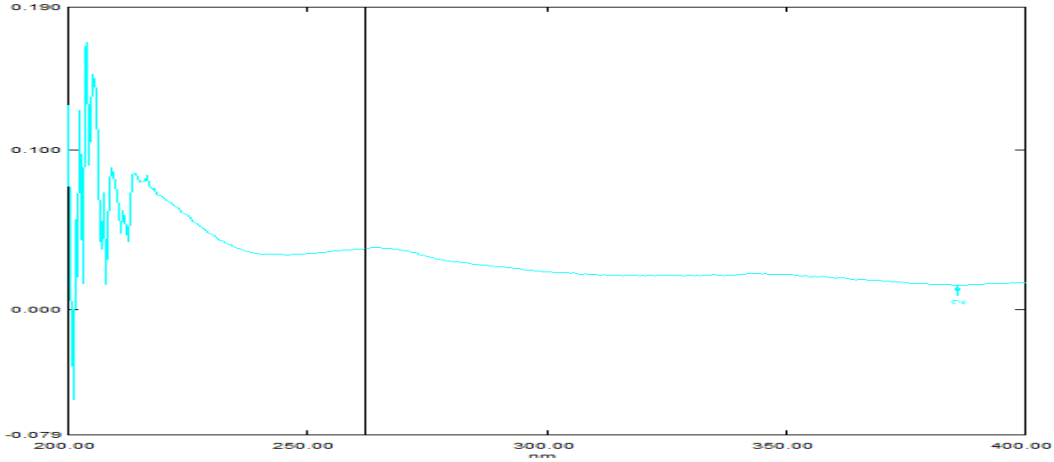


Figure 2: Absorbance maxima of aloe vera gel powder

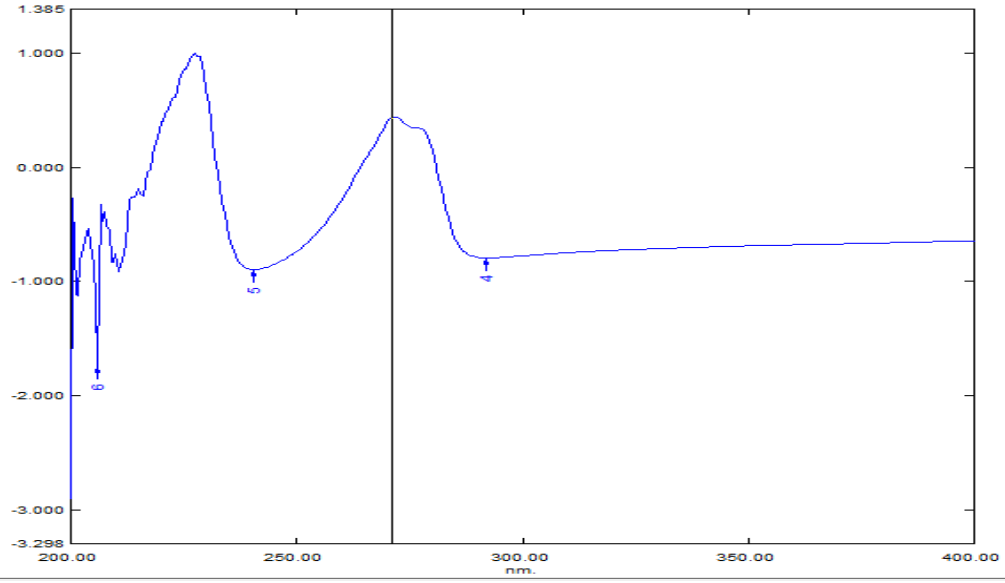


Figure 3: FTIR of Tramadol and excipient

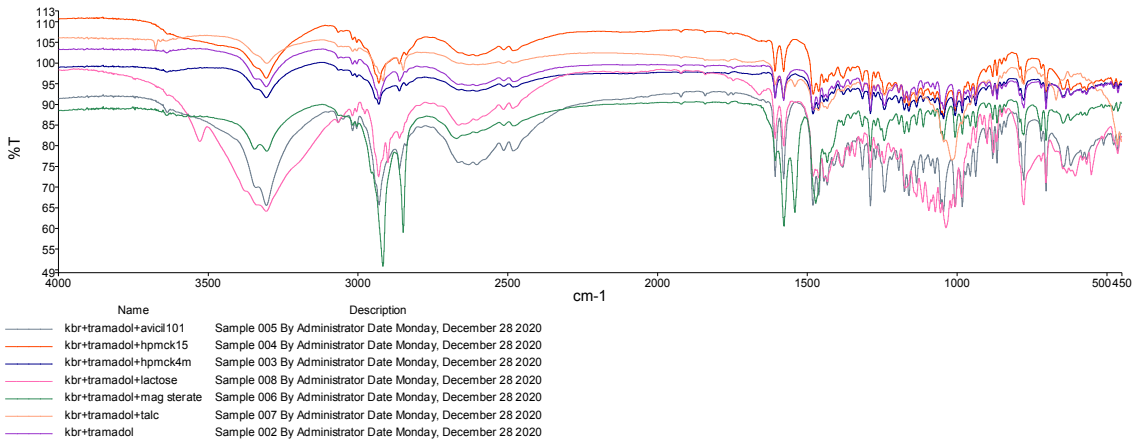


Figure 4: FTIR of Aloe vera gel powder and excipient

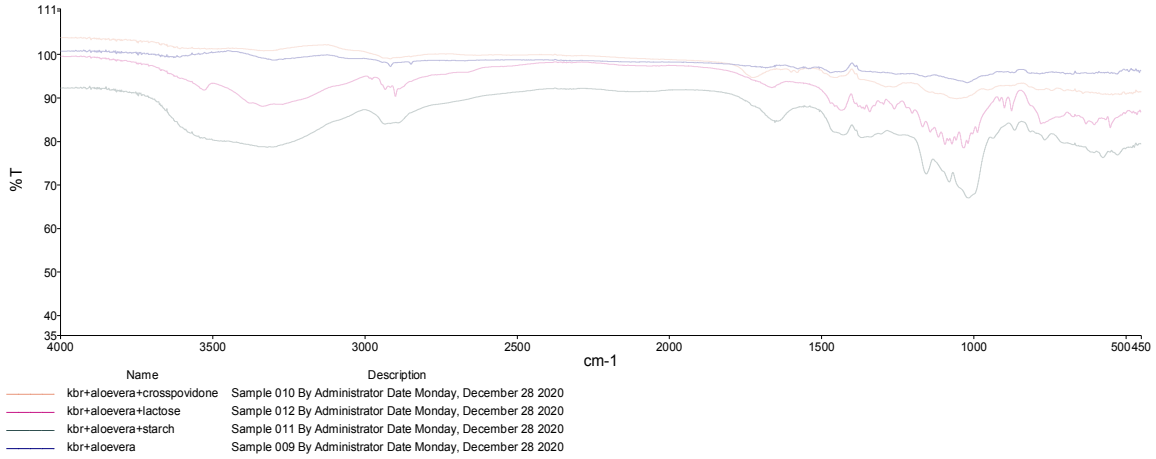


Table 4 : Preformulation study of aloe Vera gel powder and Tramadol

Sr. No.	Parameter	Aloe Vera gel powder	Tramadol
1	Identification by U. V Vis-spectrophotometer.	262 nm (ʎ max)	271 nm (ʎ max)
2	Melting Point	224 °C	183 °C
3	Solubility	Highly Soluble in water, ethanol, methanol, Phosphate buffer, poorly soluble in chloroform.	Soluble in water, methanol, ethanol, phosphate buffer, Insoluble in ether sparingly soluble in acetone.
4	Compatibility study	compatible	Compatible

Pre-compression evaluation

The micrometrics properties such as of bulk density, tapped density, Angle of repose, compressibility index, and Hausner's ratio of tramadol sustained release layer and Aloe Vera gel powder immediate release layer blend and were studied separately. The overall results were shown in table No: 4. the value of bulk density shows that good packing properties. The compressibility index of the formulation Indicating poor flow properties of powder which were further confirmed by determining the angle of repose, it is in the range of 16 ° to 26 ° which indicates good flow properties.

Table 5:Pre-compression evaluation of immediate release layer blend (Aloe Vera gel powder)

S. No.	Parameter	A1	A2	A3
1	Bulk density (g/ml)	0.529	0.515	0.509
2	Tapped density (g/ml)	0.628	0.610	0.601
3	Compressibility index (%)	15.76%	15.57%	15.30%
4	Hausner's ratio	1.87	1.18	1.18
5	Angle of repose (degree)	25.31 °	26.04 °	25.30 °

Table 6: Pre-compression evaluation of sustained release powder blend, (Tramadol)

Sr. No.	Parameter	T1	T2	T3	T4	T5	T6
1	Bulk density (g/ml)	0.441	0.486	0.555	0.530	0.514	0.539
2	Tapped density (g/ml)	0.496	0.560	0.611	0.591	0.575	0.585
3	Compressibility index (%)	11.088	13.2142	09.1653	10.3214	10.6080	7.8632
4	Hauser's ratio	1.12	1.15	1.10	1.11	1.11	1.08
5	Angle of repose (degree)	29.77°	26.43°	25.18°	27.12°	24.12°	23.96°

Post-compression evaluation of tablet

The prepared tablets were evaluated for weight variation test, dissolution test, thickness, hardness uniformity of dosage units and friability. The weight variation test is performed by weighing 20 tablets

separately, calculating the average weight and comparing the individual weights of each tablet to the average.

The hardness of each batch of the tablet was determined by using Monsanto hardness tester. The hardness was measured in unit of kg/cm2. The hardness of 6 tablets was determined using The Friability was determined by first weighing 10 tablets after dusting and placing them in a friability tester, Roche friabilator will be used, which was rotated for 4 min at speed 25 rpm. After complication of dusting, the total remaining weight of tablet was recorded and the % friability was calculated by using formula.

The thickness of each 10 tablets was calculated by using Vernier Caliper. All test value is included. Drug content uniformity and *In vitro* drug release determined according to the USP guidelines. Test values are including in table 9.

Table 7 :Post-compression evaluation of immediate release layer tablet

Sr. No.	Parameter	A1	A2	A3
1	Uniformity weight(mg)	147 mg	149mg	151 mg
2	Thickness(mm)	2mm	2mm	2mm
3	Hardness(kg/cm2)	3.1kg/cm2	3 kg/cm2	3.4 kg/cm2
4	Friability (%)	0.81%	0.50%	0.80%
5	Drug content	97.74	97.10	96.26
6	% Drug release	86.21%	90.75%	88.82%

Table 8: Post-compression evaluation of sustained release layer tablet

Sr No.	Parameter	T1	T2	T3	T4	T5	T6
1	Uniformity wt(mg)	150 mg	149 mg	151 mg	150 mg	150 mg	150 mg
2	Thickness(mm)	3.5	3.6	3.7	3.5	3.5	3.5
3	Hardness(kg/cm2)	6.5kg/cm2	7.kg/cm2	6.5 kg/cm2	6.5kg/cm2	7kg/cm2	6.5kg/cm2
4	Friability (%)	0.51%	0.92%	0.81%	0.56%	0.68%	0.72%
5	Drug content	91.40	92.50	96.65	91.63	96.55	94.20
6	% Drug release	89.63	79.06	71.23	88.96	75.99	77.12

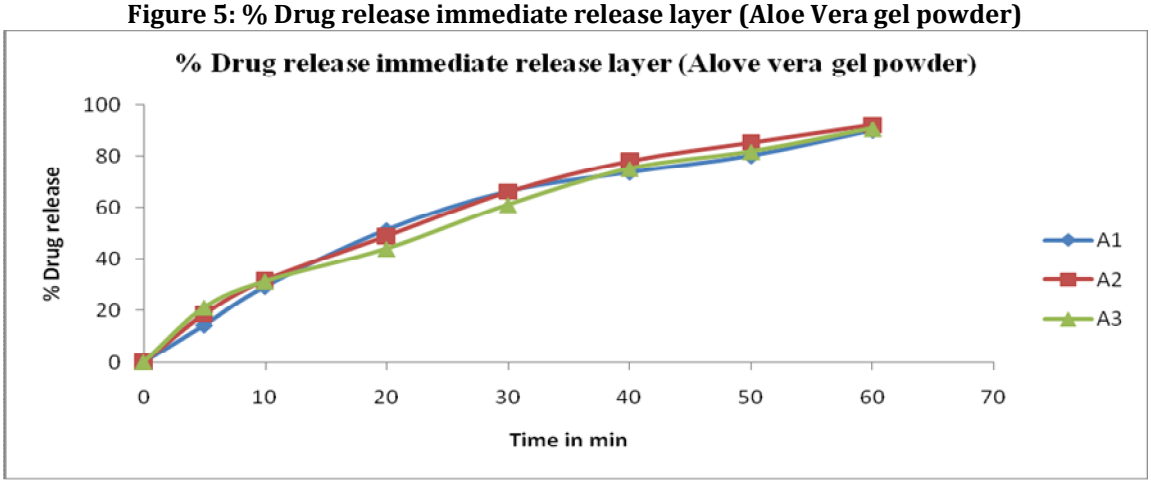
Table 9: Post-compression evaluation of bilayer tablet of A2 and T5 Optimized batch

Sr. No.	Parameter	A1D3
1	Uniformity weight(mg)	299 mg
2	Thickness(mm)	3.5 mm
3	Hardness(kg/cm2)	5.2 kg/cm2
4	Friability (%)	0.90%
5	Drug content (immediate release)	97.21
	Drug content (Sustained release)	95.49
6	% drug release (immediate release)	93.80%
	% drug release (Sustained release)	.26%

***In vitro* drug release was studied for immediate release tablet (Aloe Vera gel powder)**

The In-vitro dissolution study for the Aloe Vera gel powder which contains immediate release tablets layer were carried out in USP type-II dissolution test apparatus (Electrolab TDT-08L) (Paddle type) by using 900 ml of 0.1 N HCL at speed of 50 rpm and temperature 37±0.5°C. At pre-determined time intervals, 5 ml of the samples were withdrawn by means of a syringe fitted with a pre-filter, the Volume withdrawn at each interval was replaced with same quantity of fresh dissolution medium. The resultant samples were analyzed by measuring the absorbance at 262.5 nm using UV Visible spectrophotometer and calculate the percentage drug release. In the present study the formulation A3 has shown cumulative percent drug release of about 94.88% in 01 h as shown in figure 5.

Figure 5: % Drug release immediate release layer (Aloe Vera gel powder)



***In vitro* drug release was studied for sustained release tablet (Tramadol)**

The In-vitro dissolution study for the Tramadol sustained released tablet were carried out in USP type-II dissolution test apparatus (Electrolab TDT-08L) (Paddle type) using 900 ml of phosphate buffer at ph 6.8 at 50 rpm spped and temperature 37±0.5°C. At predetermined time (1 hr.) intervals up to 8 hrs, 5 ml of the samples were withdrawn by means of a syringe fitted with a pre-filter; the volume withdrawn at each interval was replaced with same quantity of fresh dissolution medium (phosphate buffer 6.8). The resultant samples were analyzed by measuring the absorbance at 271 nm using UV Visible spectrophotometer and calculate the percentage drug release. In the present study the formulation M1 has shown cumulative percent drug release of about 92.36% in 08 h as shown in figure 6.

Figure 6: % Drug release of the sustained released layer (Tramadol)

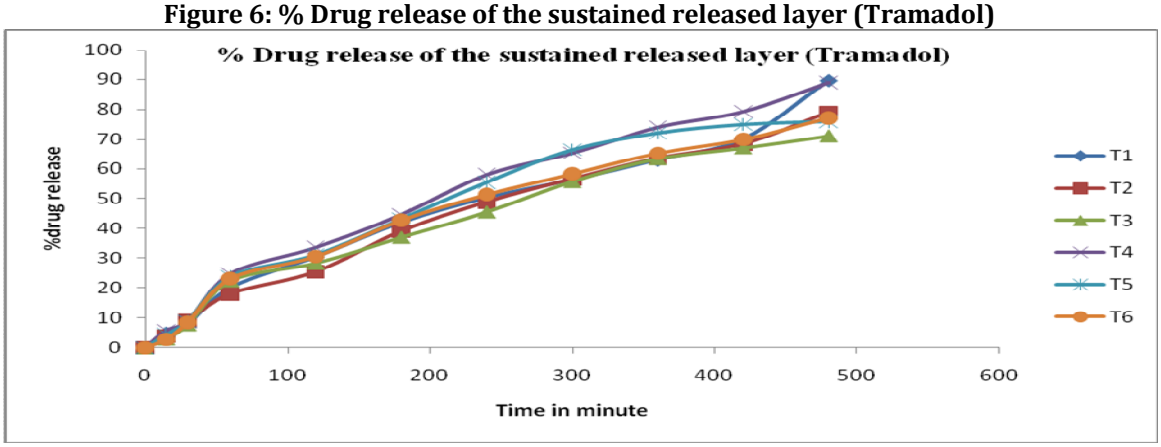
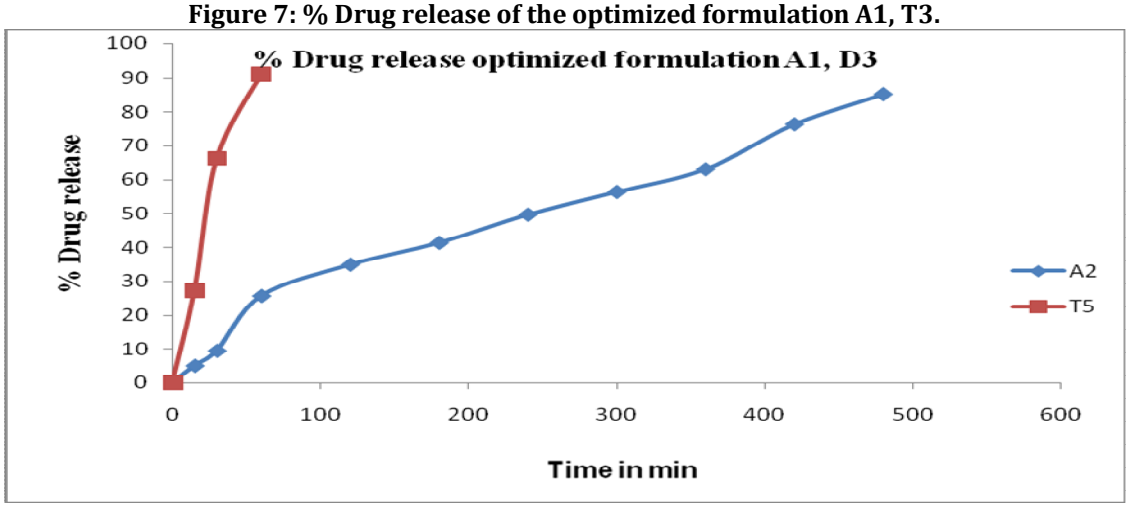


Figure 7: % Drug release of the optimized formulation A1, T3.



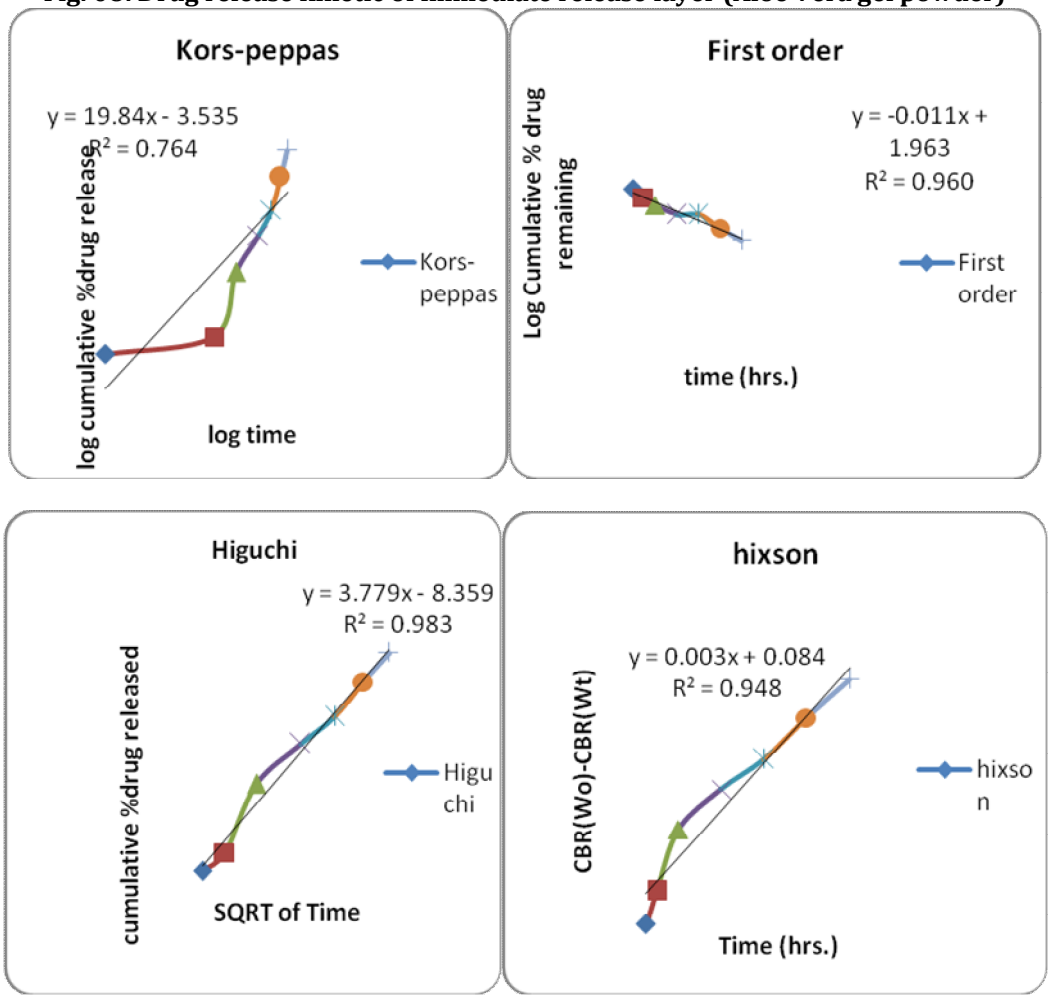
Kinetic models

Dissolution data of above bi-layered tablet was perfectly fitted in, First order, and Higuchi equations. The mechanism of drug release pattern was determined by using Higuchi equation Table 10-11, Fig 8, 9.

Table 10: Drug release kinetics of Aloe vera gel powder tablet

Time(min)	cumulative % drug released	% drug remaining	Square root time	log Cumu % drug remaining	log time	log Cumu % drug released	% Drug released	Cube Root of % drug Remaining(Wt)	Wo-Wt
0	0	100	0.000	2.000	0.000	0.000	100	4.642	0.000
5	20.21	79.79	2.236	1.902	0.699	1.306	20.21	4.305	0.337
10	35.96	64.04	3.162	1.806	1.000	1.556	15.75	4.001	0.641
20	50.31	49.69	4.472	1.696	1.301	1.702	14.35	3.676	0.966
30	50.31	49.69	5.477	1.696	1.477	1.702	0	3.676	0.966
40	66.13	33.87	6.325	1.530	1.602	1.820	15.82	3.235	1.407
50	75.99	24.01	7.071	1.380	1.699	1.881	9.86	2.885	1.757
60	83.72	16.28	7.746	1.212	1.778	1.923	7.73	2.534	2.108

Fig. 08: Drug release kinetic of immediate release layer (Aloe Vera gel powder)



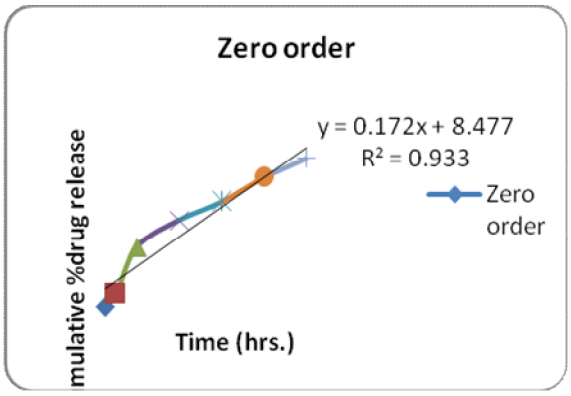
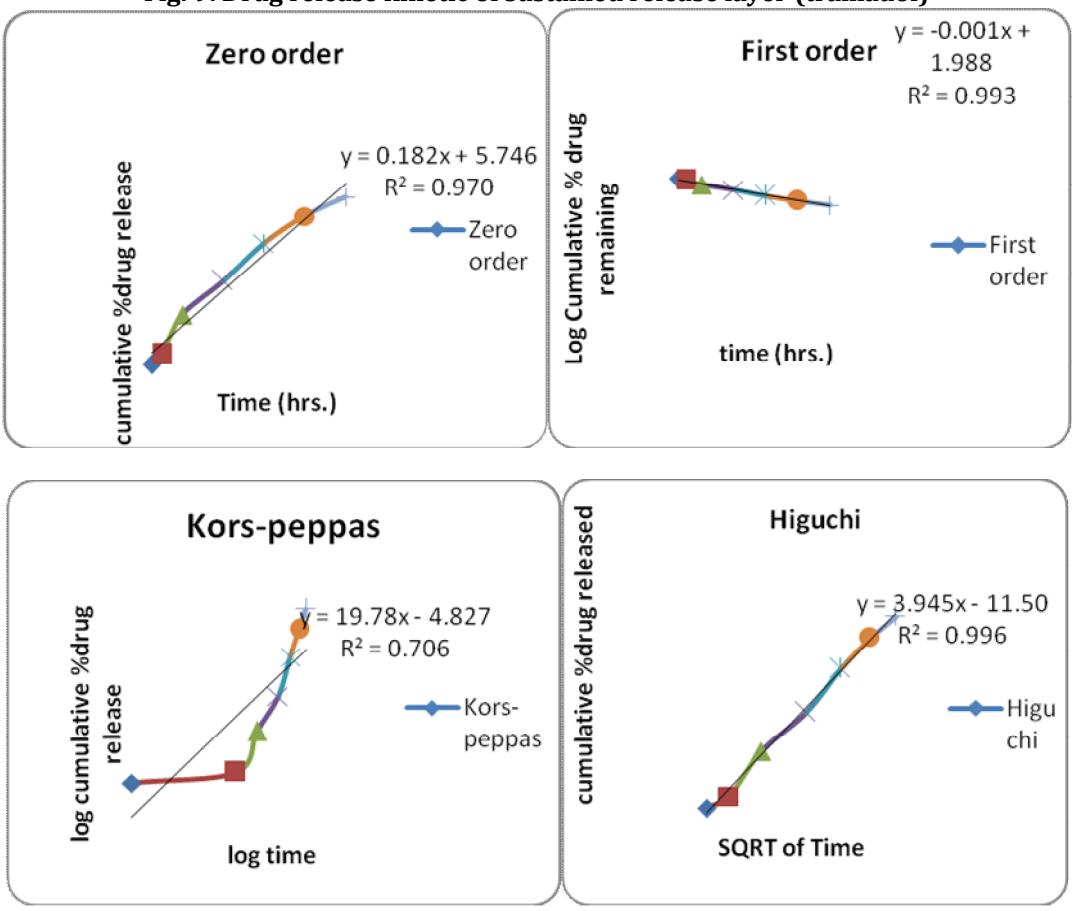
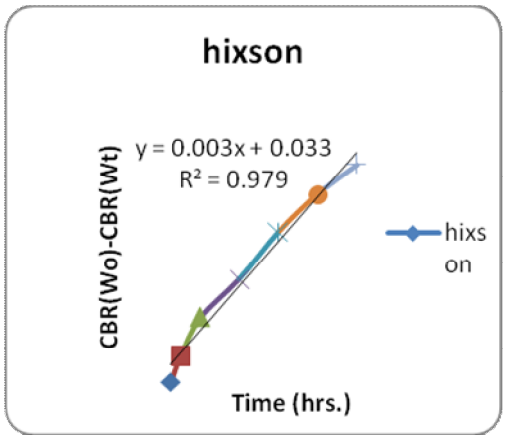


Table 11: Drug release kinetics of tramadol

Time(min)	cumulative % drug released	% drug remaining	Square root time	log Cumu % drug remaining	log time	log Cumu % drug released	% Drug released	Cube Root of % drug Remaining(Wt)	Wo-Wt
15	5.05	94.95	3.873	1.977	0.000	0.000	100	4.562	0.000
30	8.12	91.88	5.477	1.963	1.477	0.910	3.07	4.512	0.130
60	20.15	79.85	7.746	1.902	1.778	1.304	12.03	4.306	0.336
120	30.47	69.53	10.954	1.842	2.079	1.484	10.32	4.112	0.530
180	42.12	57.88	13.416	1.763	2.255	1.624	11.65	3.868	0.774
240	50.34	49.66	15.492	1.696	2.380	1.702	8.22	3.676	0.966
300	56.29	43.71	17.321	1.641	2.477	1.750	5.95	3.523	1.119
360	62.93	37.07	18.974	1.569	2.556	1.799	6.64	3.334	1.308
420	70.09	29.91	20.494	1.476	2.623	1.846	7.16	3.104	1.538
480	90.63	10.37	21.909	1.016	2.681	1.952	19.54	2.181	2.461

Fig. 9: Drug release kinetic of sustained release layer (tramadol)





DISCUSSION

The absorption maxima of Aloe Vera Gel Powder and Tramadol HCL were found to be 271 nm and 262 nm respectively. All the excipients used in formulation of bilayer tablet of Aloe Vera Gel Powder and Tramadol HCL are compatible. Various precompression parameters such as bulk density, tapped density, angle of repose, carr's index, hausner's ratio were performed. Various post-compression parameters such as uniformity of weight, thickness, hardness, friability, drug content, percentage drug release were performed. Among all the batches A1T3 was found to be optimized batch. The bulk density, tapped density, compressibility index, hausner's ratio, angle of repose of A1 layer was found to be18^0 0.529 g/ml, 0.628 g/ml, 15.76%, 1.87, 25.31^0 respectively. The bulk density, tapped density, compressibility index, hausner's ratio, angle of repose of T3 layer was found to be 0.555 g/ml, 0.611 g/ml, 09.16 %, 1.10, 25.respectively. the results of post compression parameters such as uniformity of weight, thickness, hardness, friability, drug content, percentage drug release of A1 layer was found to be 147 mg, 2 mm, 3.1 kg/cm^2. The results post compression parameters of T3 layer such as uniformity of weight, thickness, hardness, friability, drug content, and percentage drug release were found to be 151mg, 3.6 mm, 6.5 kg/cm^2, 0.81%, 96.65, 71.23% respectively. The results post compression parameters of A1 layer such as uniformity of weight, thickness, hardness, friability, drug content, and percentage drug release were found to be 151mg, 3.6 mm, 6.5 kg/cm^2, 0.81%, 96.65, 71.23% respectively. The results post compression parameters of optimized layer in bilayer tablets such as uniformity of weight, thickness, hardness, friability was found to be 248 mg, 5.3 mm, 5.2kg/cm^2, 0.58% respectively. Drug content of immediate release layer was found to be 97.74 and drug content of the sustained release layer was found to 96.65. Drug release of immediate layer was found to be 86.21% within 1 hr. Drug release of sustained release was found to be 71.23% for 8 hrs. The mechanism involve in drug release from the optimized batch A1T3 is by zero order [11-13]. Therefore the bilayer tablets were prepared from optimized immediate release layer of Aloe Vera gel powder and optimized sustained release layer of Tramadol HCL After preparing the bilayer tablets again post compression parameters were performed. The batch A1T3 containing Croaapovidone of 9 mg and HPMC K15M of 60 mg was found to be optimized batch.

CONCLUSION

The prepared tablets showed satisfactory results for various evaluation parameters such as tablet dimension, hardness, thickness, friability, weight uniformity, drug content and in vitro dissolution study. The optimized formulation based on all the parameter A2 (Crospovidone) is selected for the immediate release layer and T5 (HPMC K15M) was selected for the sustained release layer release layer. The drug release mechanism was found to be first order release; dependent on both drug diffusion and polymer relaxation. The bilayer tablets of Aloe Vera gel powder and tramadol useful for relief pain with antiulcer Aloe Vera gel powder.

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AUTHORS CONTRIBUTIONS

All the author have contributed equally

CONFLICT OF INTERESTS

Declare none

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