STUDIES ON *IN-VITRO* DISSOLUTION ENHANCEMENT OF ACECLOFENAC FROM ORAL SOLID DOSAGE FORM USING β & hp β -CYCLODEXTRIN COMPLEXES

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Abstract: The solubility behaviour of drugs remains one of the most challenging aspects in formulation and development. The Complexation with cyclodextrins is very efficient technique for enhancement of solubility and used to improve the dissolution properties and bioavailability of poorly water soluble drugs. Today 40% of all new chemical entities suffer from poor aqueous solubility. It is generally recognized that low solubility or dissolution rate often become a rate limiting step in absorption of poorly water soluble drugs from gastro intestinal tract and compromise oral bioavailability. Aceclofenac was the drug candidate selected to improve its solubility and dissolution. An attempt was made to prepare complexation with β-CD and HP-β-CD. Complexes of β-CD and HP-β-CD in 1:1 molar ratios were prepared using three methods viz. kneading, solvent evaporation and microwave irradiation techniques. 1:1 (ACE: β-CD) complex tablet with kneading method showed more than 98% of drug release within 120 min in phosphate buffer pH 7.4 as dissolution medium. 1:1 (ACE:HP-β-CD) complex tablet with solvent evaporation method showed more than 95% of drug release within 120 min in phosphate buffer pH 7.4 as dissolution medium. 1:1 (ACE-β-CD) complex tablet with kneading method showed more than 81% of drug release within 120 min in 0.1N HCL pH 1.2 as dissolution medium. Release parameter $t^{50\%}$ of developed and pure drug formulation indicated that the developed formulation has faster dissolution rate as compared to pure drug formulation.

Keywords: Aceclofenac Cyclodextrin, dissolution, β & HP β –Cyclodextrin Complexes, solubility enhancement.

I. INTRODUCTION

The oral route of drug administration is the route of choice for the formulators and continues to dominate the area of drug delivery technologies. However, though popular, this route is not free from limitations of absorption and bioavailability in the milieu of gastrointestinal tract. Whenever a dosage form is administered orally, drug in the dosage form is released and dissolves in the surrounding gastrointestinal fluid to form a solution. This process is solubility limited. Once the drug is in the solution form, it passes across the membranes of the cells lining the gastro-Intestinal tract[1]. This process is permeability limited. Then onwards the drug is absorbed into systemic circulation. In short, the oral absorption and hence bioavailability of drug is determined by the extent of drug solubility and permeability. The solubility behaviour of drugs remains one of the most challenging aspects in formulation and development. The greater understanding of dissolution and absorption behaviour of drugs with low aqueous solubility is required to successfully formulate them into bioavailable drug products[2]. The Complexation with cyclodextrins is very efficient technique for enhancement of solubility and used to improve the dissolution properties and bioavailability of poorly water soluble drugs. Today 40% of all new chemical entities suffer from poor aqueous solubility[3, 4, 5]. It is generally recognized that low solubility or dissolution rate often become a rate limiting step in absorption of poorly water soluble drugs from gastro intestinal tract and compromise oral bioavailability. Aceclofenac is a NSAID and is being presently marketed in tablet dosage forms. The oral bioavailability of aceclofenac is only 57%, one of the reasons is that aceclofenac is practically insoluble in water and is classified as a BCS class II drug[6]. Thus in the present study an attempt is made to prepare complexes with various cyclodextrin derivatives so as to enhance its solubility and dissolution rate, these drug-cyclodextrin derivative complexes be incorporated in a tablet form for increase its *in-vitro* dissolution and eventually better bioavailability.

II. Material and methods

The drug, Aceclofenac was procured as gift sample from Suyash Laboratories ltd, Tarapur, Maharashtra, India. β-CD and HP-β-CD were purchased from Gangwal Chemicals Pvt. Ltd. Boisar, India

2.1. Formulation of Complexation Tablets:

Preparation of Inclusion Complexes:

The inclusion complexes were prepared by Kneading, Solvent Evaporation and Microwave Irradiation techniques[7, 8,19]

2.1.1. Kneading method:

Aceclofenac with β-CD in molar ratios (i.e. 1:1M) and with HP- β-CD in ratios (i.e.1:1M) were taken. First cyclodextrin is added to the mortar, small quantity of 50% ethanol is added while triturating to get slurry like consistency. Then slowly drug is incorporated into the slurry and trituration is further continued for one hour. Slurry is then air dried at 25^0C for 24hours, pulverized and passed through sieve No. 80 and stored in desiccators over fused calcium chloride[8,9].

Sr. No	Batch code	Composition	Molar Ratio
1	K1	ACECLOFENAC:β-CD	1:1
2	K2	ACECLOFENAC:HP-β-CD	1:1

Table 2.1.1.1: Composition of Aceclofenac, β-CD and HP-β-CD complex by kneading

2.1.2. Solvent Evaporation method:

The required molar quantities of ACE, β CD and HPβCD were weighed accurately and dissolved in minimum amount of ethanol and water respectively. The solution of ACE was added dopwise into the β CD and HPβCD solution. The contents were continuously stirred on hot plate till complete evaporation of solvent. Finally, the mass was dried at 45^0C for approximately 6 hours. The dried mass was pulverized and passed through sieve No. 80 and stored in desiccators over fused calcium chloride[10,18]

Sr. No	Batch code	Composition	Molar Ratio
1	S1	ACECLOFENAC:β-CD	1:1
2	S2	ACECLOFENAC:HP-β-CD	1:1

Table 2.1.1.1: Composition of Aceclofenac, β-CD and HP-β-CD complex by solvent evaporation

2.1.3. Microwave Irradiation method:

The required molar quantities of ACE, βCD and HPβCD were weighed accurately and dissolved in minimum amount of ethanol and water respectively. The solution of ACE was added drop wise into the β CD and HβCD solution. The contents were kept in microwave at 60^0C for two minutes. The ice cold water is added to the solution causes precipitation of complex. Finally, the mass was dried at 45^0C for approximately 6 hours. The dried mass was pulverized and passed through sieve No. 80 and stored in desiccators over fused calcium chloride[11].

Sr. No	Batch code	Composition	Molar Ratio
1	M1	ACECLOFENAC:β-CD	1:1
2	M2	ACECLOFENAC:HP-β-CD	1:1

Table 2.1.3.1: Composition of Aceclofenac, β-CD and HP-β-CD complex by microwave irradiation

2.2 Formulation of complexation tablets:

Preparation of tablet the complex of ACE-β-CD and ACE-HP-β-CD were prepared into tablet by direct compression method containing 50 mg of ACE is shown in table 5.4. The complex, crospovidone and microcrystalline cellulose were passed through sieve # 80. All the above ingredients were properly mixed together. Talc and magnesium stearate were mixed. The mixture was then compressed in to tablet. The formulation of tablet is shown in table 2.2.1.

Sr. No.	Ingredients	Quantity in mg/tablet
1	ACE: β-CD	212*
2	Crosspovidone	10
3	Microcrystalline cellulose	24
4	Talc	2
5	Magnesium stearate	2
6	Total	250

* ACE 50mg.

Table 2.2.1: Composition of tablet formulations

2.3. Preformulations tudy

Various tests were carried out on the sample of the drug to establish its identity and purity and the results were compared with specifications reported in literatures[12], wherever possible. The parameters studied include

Identification Test

1. Description:

The drug sample was analyzed for physical appearance, color and odor and melting point of aceclofenac was recorded by capillary method using Thiele's tube melting point apparatus

2. Solubility:

The solubility of the drug was evaluated by dissolving drug in different solvents like water and phosphate buffer 7.4at room temperature was determined.

3. Powder characterization:

The powder characteristics such as bulk density, tapped density, compressibility index, housner ratio and angle of repose for the ACE powder sample were determined[13].

4. Assay:

The accurately weighed quantity, approximately 10mg, of pure drug (ACE) sample was dissolved in the 100ml phosphate buffer 7.4. 5ml of this solution was suitably diluted to get 10ug/ml drug solution. The drug content was determined using UV/VIS double beam Specrtophotometer[14].

5. Characterization of the excipients:

The preformulation parameters studied for the solid powder excipients include: Desccription, Solubility, Melting point, Bulk density, Tapped density, Compressibility index, Housner ratio, FTIR Spectra, DSC thermographs[15]

6. DSC Study:

Differential scanning calorimetry (DSC, Shimadzu TA 60WS, Singapore) to investigate the thermal behaviors of the raw material of ACE, β-CD and HP-β-CD complex powders

2.4. Method of drug Analysis

2.4.1 Standard calibration curve of ACE in phosphate buffer pH 7.4 solution:

Standard stock solution containing 100ug/ml ACE was prepared in phosphate buffer pH 7.4. Different aliquots were taken from the stock solution, diluted to 10ml mark with same solvent to obtain series of concentrations. The absorbance of the samples was taken at λ_{max}=273.5 nm and noted. Standard curve was plotted and regression coefficient was determined[14].

2.4.2 Standard calibration curve of ACE in 0.1N HCL pH 1.2 solution:

Standard stock solution containing 100ug/ml ACE was prepared in 0.1N HCL pH 1.2. Different aliquots were taken from the stock solution, diluted to 10ml mark with same solvent to obtain series of concentrations. The absorbance of the samples was taken at λ_{max}=273 nm and noted[14].

2.5. Evaluation of the tablets:

The formulated tablets and marketed tablets were evaluated for hardness, friability, thickness, disintegration time, drug content, and content uniformity test[13].

1. Hardness:

Hardness of the tablets was determined using Monsanto hardness tester.

2. Weight variation:

The USP weight variation test is done by weighing 20 tablets individually, calculating the average weight and comparing the individual weights to the average.

3. Friability test:

The friability of the tablets was determined using Roche type friabilator. The apparatus was operated for 4 min at speed of 25 rpm.

4. Thickness:

Tablet thickness was measured using vernier caliper.

5. Disintegration test:

Disintegration time of the tablets was determined using USP tablet disintegration tester. To test disintegration time, one tablet was placed in each tube of the apparatus, and basket rack was positioned in a 1L beaker of distilled water, at 37^0C. The apparatus was operated till complete disintegration of all the tablets and the disintegration time for each tablet noted. The mean disintegration time was calculated.

6. Drug content:

10 tablets were taken and weighed accurately, mean weight determined. The tablets were then crushed into fine powder. An accurately weighed quantity of the powder equivalent to 10 mg of Aceclofenac was transferred into 100ml volumetric flask containing 50 ml of methanol, shaken manually for 10 min., volume was adjusted to the mark with the same solvent and filtered through Whatmann filter paper no. 41. After appropriate dilutions of sample, the drug content was determined using UV/VIS double beam Spectrophotometer (Jasco Corporation, Japan) at 273.5nm.

7. *In vitro* dissolution study*:*

In phosphate buffer of pH 7.4 as dissolution medium:

In-vitro dissolution of tablet was studied in USP XXIV dissolution apparatus (Electrolab) employing a paddle stirrer. 900 ml of phosphate buffer of pH 7.4 was used as dissolution medium. The stirrer was adjusted rotate at 75 rpm. The temperature of dissolution media was previously warmed to 37 ± 0.5^0C and was maintained throughout the experiment. 2 ml of sample of dissolution medium were withdrawn by means of syringe at known intervals of time and analyzed for drug release by measuring the absorbance at 273.5 nm after suitable dilution with phosphate buffer pH 7.4. The volume withdrawn at each time interval was replaced with fresh quantity of dissolution medium. Percentage amount of Aceclofenac released was calculated and plotted against time. For comparison, the dissolution of marketed tablet was studied[16].

In 0.1 N Hcl pH 1.2 as dissolution medium:

In-vitro dissolution of tablet was studied in USP XXIV dissolution apparatus (Electrolab) employing a paddle stirrer. 900 ml of 0.1 N HCL of pH 1.2 was used as dissolution medium. The stirrer was adjusted rotate at 75 rpm. The temperature of dissolution media was previously warmed to 37 ± 0.5^0C and was maintained throughout the experiment. 2 ml of sample of dissolution medium were withdrawn by means of syringe at known intervals of time and analyzed for drug release by measuring the absorbance at 273 nm after suitable dilution with 0.1 N HCL of pH 1.2. The volume withdrawn at each time interval was replaced with fresh quantity of dissolution medium. Percentage amount of Aceclofenac released was calculated and plotted against time. For comparison, the dissolution of marketed tablet was studied[17].

III. RESULTS AND DISCUSSION

3.1. Preformulation study

Test	Specifications	Results
Colour	White	Confirms
Odour	Odourless	Confirms
Physical state	Powder	Confirms
Identification	FTIR	Positive
Melting point	(149°C-153°C)	151^{0}C
Solubility	Insoluble in water, soluble in acetone, ethanol .	Confirms

Table 3.1.1. Characterization of Aceclofenac

3.2. Solubility:

The solubility of Aceclofenac in distilled water was found to be 282.8 ug/ml.

3.3. Powder characterization:

The results of powder characterization of Aceclofenac are as follows:

Bulk density	0.483 g/cm3
Tapped density	0.546g/cm3
Compressibility index	11.53%
Angle of repose	220.31’

3.4. Assay:

The percentage purity of the ACE was found to be 98.56%.

3.5. FTIR analysis:

FTIR Spectrum ACE sample shows all the characterstic peaks of functional group present in the ACE Structure. The spectrum of pure ACE showed a distinct absorption band for the carbonyl group C=O at 1636cm^{-1}, amide NH at 3419cm^{-1}, acid C=O at 1771cm^{-1}, and the O-H band at 2970cm^{-1}, which are labeled in the The spectrum also showed C-H aromatic out-of-plane bends at 900-690 cm^{-1}.

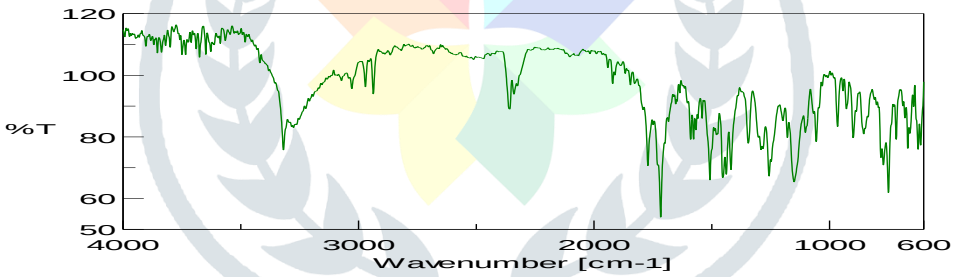

Fig. 3.5.1: FTIR spectra of Aceclofenac

3.6. Characterization of the Excipients:

Test	Specifications	Results
Description	White, practically odorless, fine crystalline powders, having a slightly sweet taste.	Complies
Solubility	1 in 50 parts of water at 20^{0}C. Practically insoluble in acetone, ethanol (95%) and methylene chloride.	Complies
FTIR spectra	FTIR spectrum observed for the specific functional groups present in structure of β-CD	Complies
M.P.	258^{0}C	260^{0}C
Loss on drying	<16%	14.1%
Bulk density	0.681 g/cm^3	0.668 g/cm^3
Tapped density	0.916 g/cm^3	0.911g/cm^3

Table 3.6.1: Characterization of β-CD

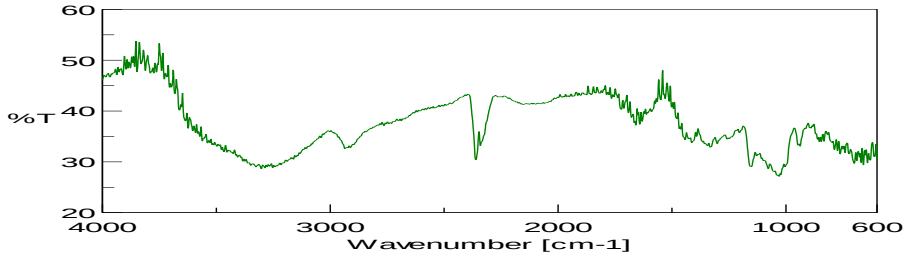

Fig 3.6.1: FTIR spectra of β-CD

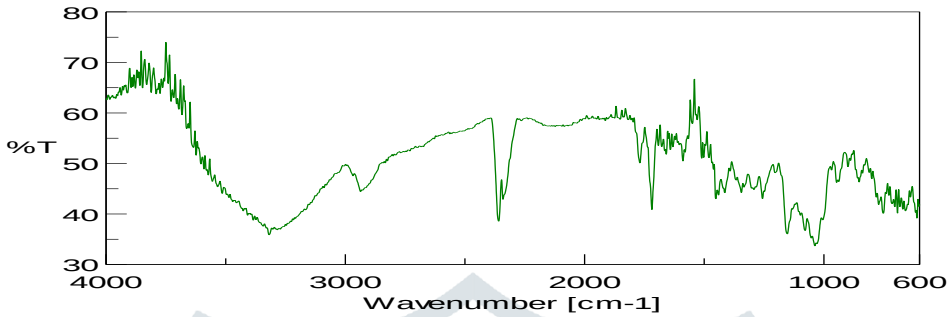

Fig 3.6.2: FTIR spectra of β-CD(1:1) complex with kneading method

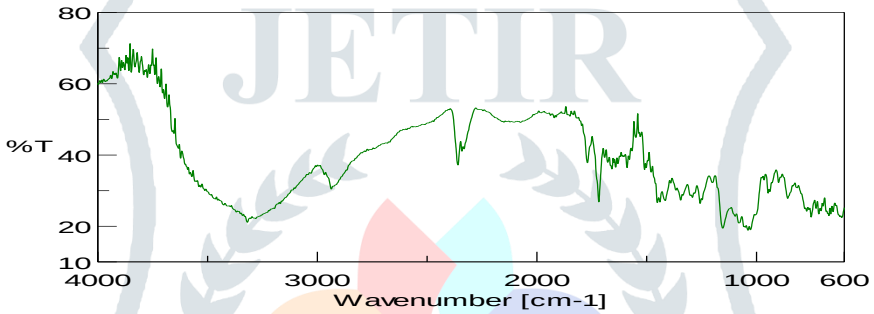

Fig 3.6.3: FTIR spectra of β-CD(1:1) complex with solvent evaporation method

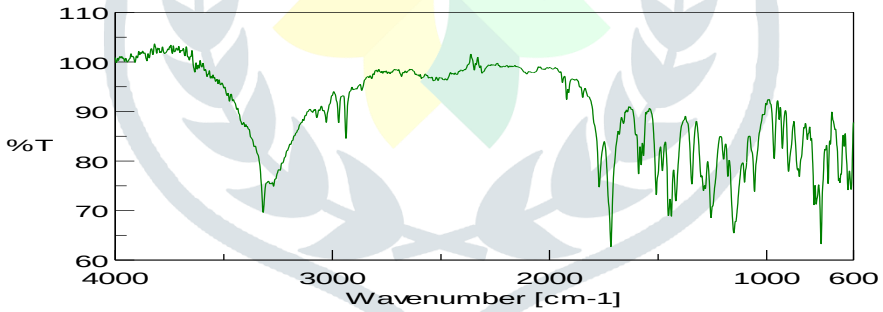

Fig 3.6.4: FTIR spectra of β-CD(1:1) complex with microwave irradiation method

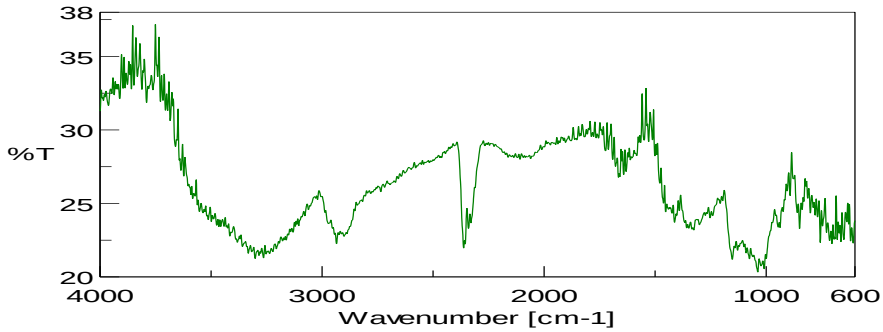

Fig 3.6.5: FTIR spectra of HP-β-CD

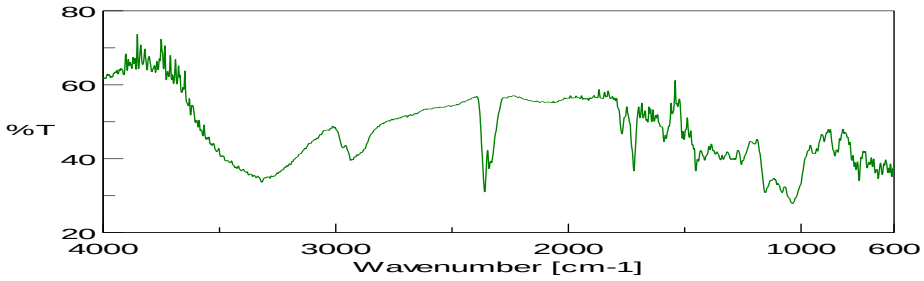

Fig 3.6.6: FTIR spectra of HP-β-CD(1:1) complex with kneading method

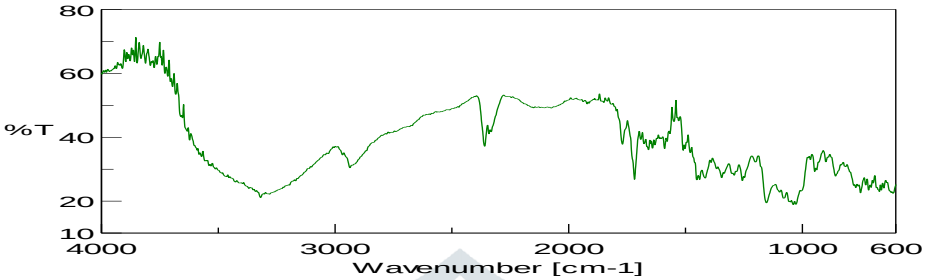

Fig 3.6.7: FTIR spectra of HP-β-CD(1:1) complex with solvent evaporation method

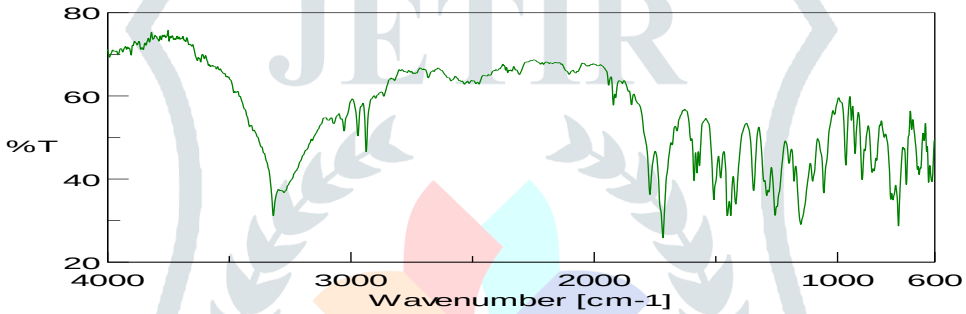

Fig 3.6.8: FTIR spectra of HP-β-CD(1:1) complex with microwave irradiation method

Sr. No.	Drug/Carriers	Functional group	Frequency(cm^{-1})
1	**Aceclofenac**	O-H stretching	3481
		C-H stretching	2970
		O-C=O-OH	1636
		-N-H-	3419
2	**β-CD**	CH_2OH	1332
		CH_2OCH_2	1151

Table 3.6.2: FTIR analysis data

Sr. No.	Solid dispersion/ Complex	Functional group	Frequency(cm^{-1})
1	**ACE: β-CD**	O-H	3590
		C-H	2936
		O-C=O-OH	1631
		-N-H-	3572
		CH_2OH	1332
		CH_2OCH_2	1151
2	**ACE: HP-β-CD**	O-H	3682
		C-H	2937
		O-C=O-OH	1641
		-N-H-	3653
		CH_2OH	1345
		CH_2OCH_2	1153

Table 3.6.3: Interpretation of IR spectra.

3.7. DSC analysis:

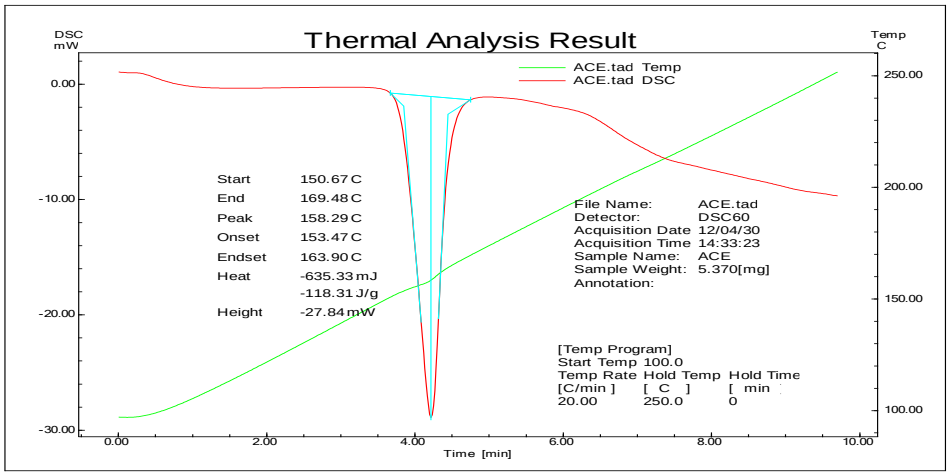

Fig 3.7.1: DSC themogram of Aceclofenac

3.8. UV-spectrophotometric method of analysis of Aceclofenac:

3.8.1. Construction of Calibration curve in phosphate buffer pH 7.4:

Calibration curve of Aceclofenacwas taken atλmax 273.5 nm in phosphate buffer pH 7.4

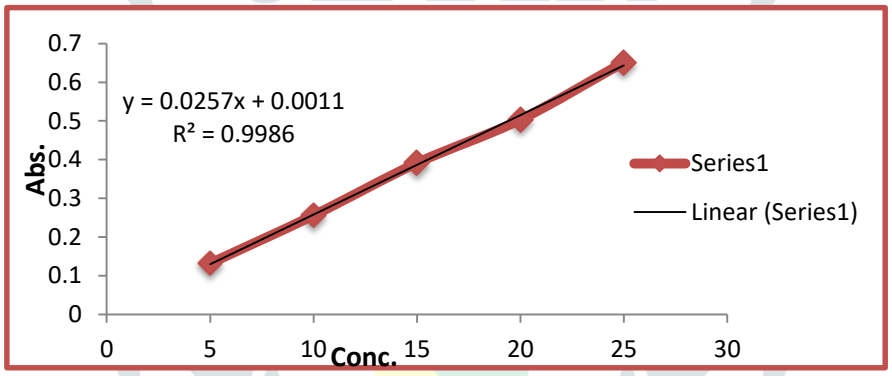

Fig 3.8.1.1: Calibration curve of ACE in phosphate buffer pH 7.4

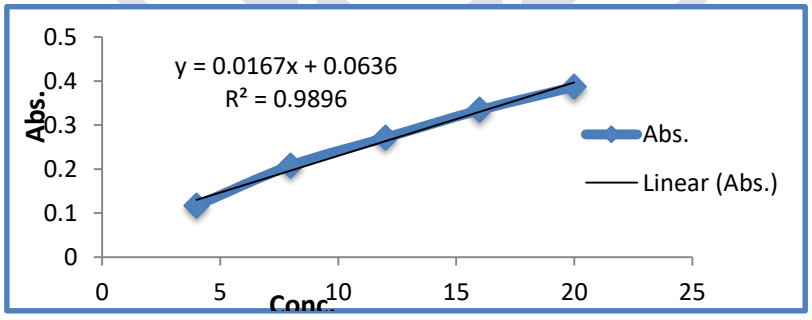

Fig 3.8.1.2: Calibration curve of ACE in 0.1 N HCL

3.9. Formulation approach:

Tablets of the complexes are prepared as per the Table 2.2.1. The formulation codes of developed formulation are as follows:

Sr.no.	Complex used in the Formulation	Code
1	ACE Pure drug Formulation	P1
1	1:1 ACE:β-CD prepared by kneading method	K1
2	1:1 ACE:HP-β-CD prepared by solvent evaporation method	S1

Table 3.9.1: Code of Complex used in the Formulation.

3.10. Statistical analysis:

One way ANOVA test was followed by Dunnett test to compare the release pattern of optimized and marketed product.The P value is 0.2848, considered not significant.

Dunnett Multiple Comparisons Test:

Control column: Marketed formulation

If the value of q is greater than 2.464 then P value is less than 0.05.

Comparison	q value	P value	Level of significance
Marketed formulationvs S1	-33.308	3.102	*
Marketed formulation vs K1	-11.833	0.7810	Ns
Marketed formulation vs P1	7.607	0.7084	Ns

*significant (since P<0.05), Ns- not significant (since P>0.05)

Test shows that the K1 formulation, 1:1 ACE: β-CD prepared by kneading method, has shown significant increase in dissolution profile as compared to marketed formulation.

Tests	Formulations			
	P1	K1	S1	Marketed
Disintegration time	7.2	8.3	9	7.5
Friability	0.45%	0.28%	0.25%	0.35%
Hardness	5	5	5	5
Thickness	4.2mm	4.6 mm	4.8 mm	5 mm
Drug content	98.65%	98.71%	99.57%	98.46

Table 3.10.1: Evaluation of physical parameters of developed formulation and marketed formulation

Sr. No	Tablets	Dissolution t_{50}% (min)
1	P1	57.87
2	K1	39.06
3	S1	42.80
4	Marketed	58.61

Table 3.10.2: Release parameter, $t_{50\%}$, of developed formulation and marketed formulation

The study of physical parameters of the developed formulation revealed that the developed formulation was acceptable in regard to drug content, friability, hardness and thickness. Release parameter $t_{50\%}$ of developed formulation and marketed formulation indicated that the all the developed formulation has faster dissolution rate as compared to marketed formulation, Acemiz® 100mg tablets.

Sr.no.	Time(min)	%Drug release *
1	5	5.62 ±0.007
2	15	11.25 ±0.002
3	30	18.00 ±0.003
4	45	23.62 ±0.005
5	60	31.50 ±0.008
6	75	38.25 ±0.001
7	90	43.87 ±0.006
8	105	48.37 ±0.009
9	120	58.50 ±0.003

*n=3 ±SD

Table 3.10.3: Dissolution test data of Tablet formulation ACE pure Drug (P2) in 0.1N HCL P^H 1.2

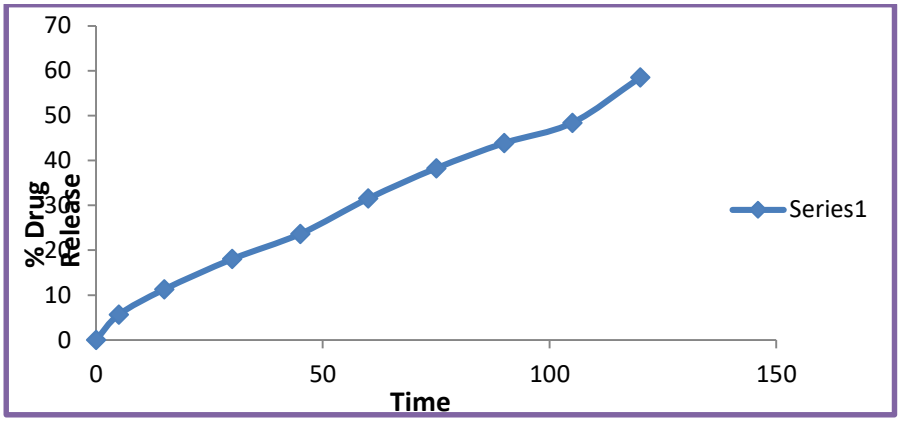

Fig 3.10.1: Dissolution profile of Tablet formulation ACE Pure drug in 0.1 N HCL.

Sr.no.	Time(min)	%Drug release *
1	5	12.37±0.003
2	15	21.37±0.004
3	30	32.62±0.008
4	45	41.62±0.005
5	60	49.50±0.009
6	75	56.25±0.001
7	90	64.12±0.006
8	105	70.87±0.002
9	120	81.00±0.004

*n=3 ±SD

Table 3.10.4: Dissolution test data of Tablet formulation ACE: β-CD(1:1) complex by kneading method (K2) in 0.1N HCL

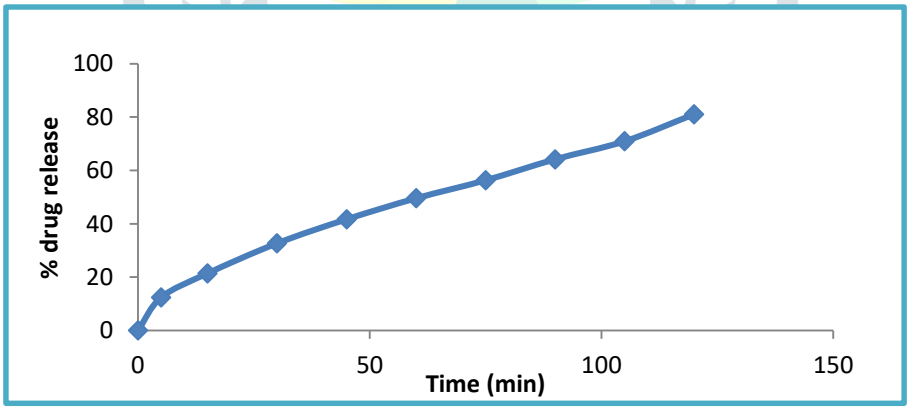

Fig 3.10.2: Dissolution profile data of Tablet formulation ACE: β-CD (1:1) complex by kneading method in 0.1 N HCL

Sr.no.	Time(min)	%Drug release*
1	5	9.00±0.004
2	15	15.75±0.002
3	30	22.50±0.006
4	45	33.75±0.003
5	60	38.25±0.009
6	75	43.87±0.007
7	90	49.50±0.002
8	105	59.62±0.008
9	120	77.62±0.001

*n=3 ±SD

Table 3.10.5: Dissolution test data of Tablet formulation ACE: HP-β-CD(1:1) complex by solvent evaporation method (S2) in 0.1N HCL

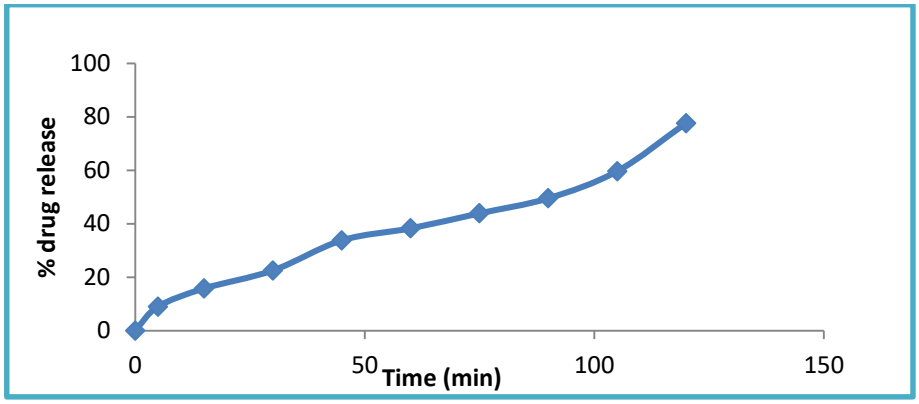

Fig 3.10.3: Dissolution profile data of Tablet formulation ACE: HP-β-CD(1:1) complex by solvent evaporation method in 0.1 N HCL

Sr.no.	Time(min)	%Drug release *
1	5	12.24 ±0.003
2	15	19.44 ±0.005
3	30	31.68 ±0.005
4	45	41.76±0.006
5	60	51.84±0.005
6	75	59.76±0.009
7	90	69.12±0.008
8	105	73.44±0.001
9	120	76.32±0.001

*n=3 ±SD

Table 3.10.6: Dissolution test data of Tablet formulation ACE pure Drug (P1) in Phosphate Buffer P^H 7.4

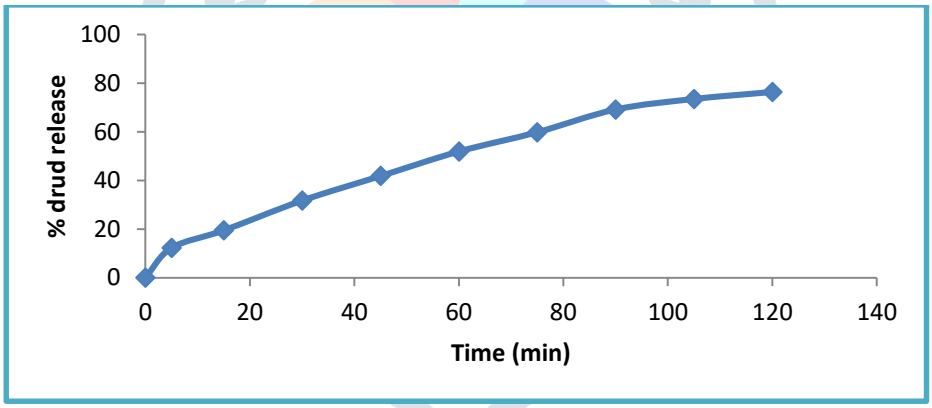

Fig 3.10.4: Dissolution profile of Tablet formulation ACE Pure drug in phosphate buffer pH 7.4.

Sr.no.	Time(min)	%Drug release*
1	5	33.12±0.003
2	15	41.76±0.003
3	30	48.96±0.009
4	45	57.60±0.003
5	60	64.08±0.007
6	75	82.08±0.004
7	90	89.28±0.002
8	105	95.04±0.002
9	120	98.64±0.001

*n=3 ±SD

Table 3.10.7: Dissolution test data of Tablet formulation ACE: β-CD(1:1) complex by kneading method (K1) in Phosphate Buffer P^H 7.4

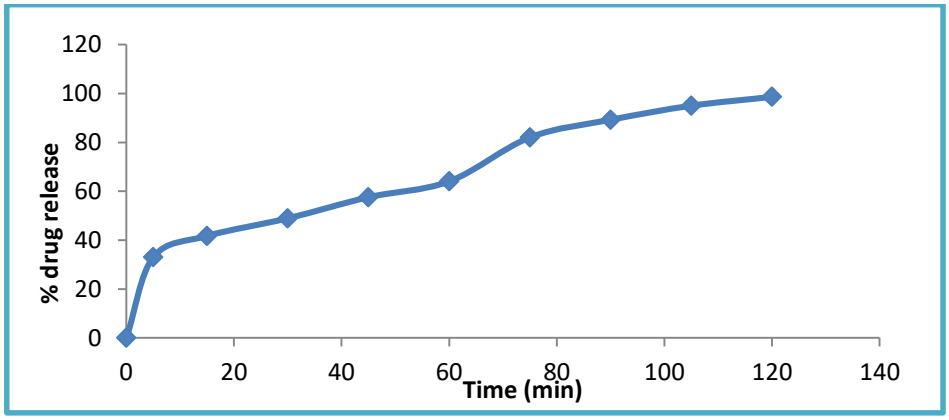

Fig 3.10.5: Dissolution profile data of Tablet formulation ACE: β-CD (1:1) complex by kneading method in phosphate buffer.

Sr.no.	Time(min)	%Drug release*
1	5	28.80±0.003
2	15	38.88±0.002
3	30	44.64±0.002
4	45	52.56±0.002
5	60	59.76±0.003
6	75	80.64±0.003
7	90	87.12±0.004
8	105	92.16±0.002
9	120	95.04±0.003

*n=3 ±SD

Table 3.10.8: Dissolution test data of Tablet formulation ACE: HP-β-CD(1:1) complex by solvent evaporation method (S1) in Phosphate Buffer P^H 7.4

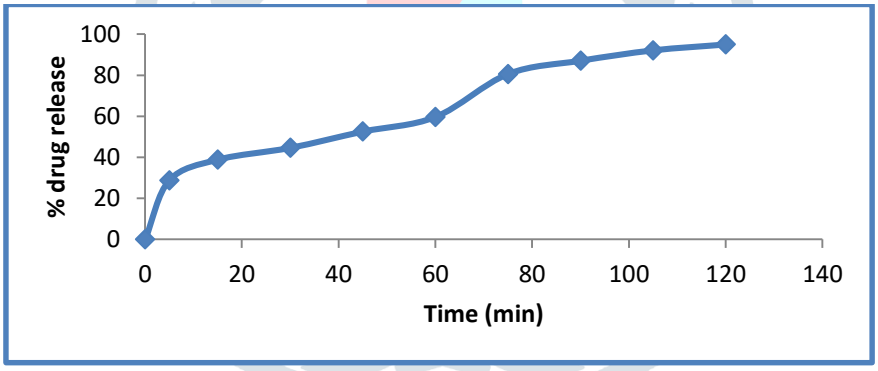

Fig 3.10.6: Dissolution profile data of Tablet formulation ACE: HP-β-CD(1:1) complex by solvent evaporation method in phosphate buffer

3.11. Comparison of marketed formulation with optimized formulations:

Sr.no.	Time(min)	%Drug release*
1	5	33.84±0.005
2	15	36.36±0.001
3	30	43.56±0.001
4	45	47.88±0.002
5	60	51.18±0.003
6	75	60.84±0.003
7	90	70.00±0.005
8	105	77.04±0.004
9	120	81.36±0.003

*n=3 ±SD

Table 3.11.1: Dissolution test data of Marketed formulation (M1) in Phosphate Buffer P^H 7.4

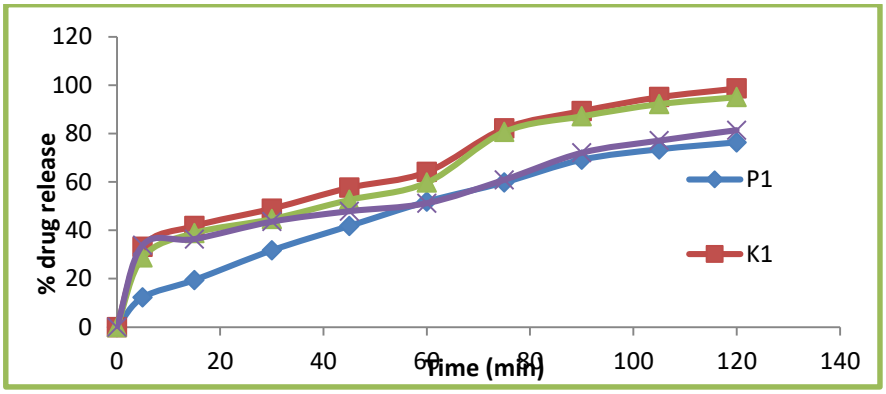

Fig 3.11.1: Dissolution profile of Marketed formulation, Formulation tablets of Complexation using different techniques.

3.12. Drug release kinetics:

The dissolution profile of all the batches were fitted to zero order kinetics, first order kinetics, Higuchi, Hixson-Crowell, Korsmeyer and Peppas to ascertain the kinetic modeling of drug release by using a PCP Disso Version 2.08 software, and the model with the higher correlation coefficient was considered to be the best model.

Release exponent (n)	Drug transport mechanism
0.5	Fickian diffusion
0.5<n<1	Anomalous transport
1.0	Case II transport
Higher than 1.0	Super Case II transport

Table 3.12.1: Dissolution profile

Drug release kinetics studies data for all batches were studied; this data was treated to study the best linear fit model.

1) $Q_1=Q_0+K_0t$	(Zero order kinetics)
2) Log $Q_1=Q_0+K_1t/2.303$	(First order kinetics)
3) $Q_1=K_H\ t^{1/2}$	(Higuchi Model)
4) $Q_0^{1/3}-Qt^{1/3}=K_1t$	(Hixson-Crowell model)
5) $Q_t/Q_\infty=Kt^n$	(Korsmeyer Peppas model)

Table 3.12.2: Linear fit model

Where,
Q_t=Amount of drug released at time t,
Q_0=Initial amount of drug,
K=release rate constant,
n= release exponent, indicative of drug release mechanism

Formulation Code	r^2					N	K
	Zero Order	First order	Matrix	Korsmeyer Peppas	Hixon Crowell		
P1	0.9571	0.9970	**0.9892**	0.9952	0.9917	0.6069	4.1729
K1	0.8422	0.9621	**0.9843**	0.9665	0.9785	0.3628	15.9567
S1	0.8764	0.9767	**0.9838**	0.9640	0.9779	0.3953	13.2343
M1	0.7623	0.9516	**0.9605**	0.9294	0.9174	0.2895	17.6456
K2	0.9527	0.9877	**0.9917**	0.9970	0.9884	0.5578	5.0989

S2	0.9744	0.9494	**0.9594**	0.9856	0.9680	0.6050	3.3959

As observed from kinetics of *in-vitro* drug release data, formulation P_1 to S_2 a higher correlation as indicated by R^2 was observed for the Higuchi matrix type of release as best fit model.

IV. CONCLUSION

Release parameter $t^{50\%}$ of developed and Marketed formulation indicated that the developed formulation has faster dissolution rate as compared to Marketed formulation. Thus finally it is concluded that tablet formulation of Aceclofenac containing ACE-β-CD, Crosspovidone, Microcystalline cellulose, Talc and Magnesium stearate (K1) shows better enhancement of *in-vitro* dissolution of the drug and thus has potential for better bioavailability.

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