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Original Research Article

Design, *In-Vitro* Evaluation of Diclofenac Sodium Fast Disintegrating Tablets by Using Aegle Marmelos as a Natural Polymer

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Abstract: Diclofenac sodium is a non-steroidal anti-inflammatory drug with analgesic and anti-inflammatory properties was selected as a model drug. The aim of the present work is to formulate a tablet which disintegrate, dissolve rapidly and give its rapid onset of action. The present study was to formulate and *in-vitro* evaluation of fast disintegrating tablets of Diclofenac sodium using fast disintegrating agents like Sodium Starch Glycolate, Crosspovidone and Natural polymer such as Aegle marmelos (Bael Fruit) gum powder by direct compression technique in the concentration of 2%W/W, 4%W/W, 6%W/W & 8%W/W. Each formulation was evaluated for various pre and post compression parameters such as Flow property, Bulk density, Tapped density, Weight variation, Hardness, Friability, Wetting time, Disintegration time, Assay, *in-vitro* dissolution. Among the 12 formulations, F12 formulation Diclofenac sodium with 8%w/w of Aegle marmelos showed better disintegration time and enhance the dissolution rate. From the *In-Vitro* dissolution rate studies 99.97% release of drug within 25 minutes and the mechanism of drug release from the tablets was followed to be first order kinetics. FT-IR studies showed there was no interaction between the drug and polymers (or) excipients.
Keywords: Diclofenac Sodium, NSAID, Sodium Starch Glycolate, Crosspovidone, Aegle marmelos.

INTRODUCTION

Oral drug delivery is the most desirable and preferred method of administering therapeutic agents to attain systemic effects mainly because of patient acceptance, convenience in administration and cost-effective manufacturing process. For many drug substances, conventional fast disintegrating tablets provide clinically effective therapy, by maintaining the required balance of pharmacokinetic and pharmacodynamic profiles with an acceptable level of safety to the patient. These agents are formulated to produce maximum stability, activity and bioavailability [1]. Fast disintegrating tablets release tablets are those which disintegrate rapidly and get dissolved to release the medicaments. Immediate release may be provided for by way of an appropriate pharmaceutically acceptable diluent or carrier, which diluent or carrier does not prolong, to an appreciable extent, the rate of drug release and/or absorption [2].

A disintegrant is an excipient, which is added to a tablet or capsule blend to aid in the breakup of the compacted mass when it is put into a fluid environment. In many cases disintegrants have the major role in the disintegration and dissolution process of rapidly disintegrating tablets made by direct compression these are agents added to tablets and some encapsulated formulations to promote breakup of tablets and capsules slugs into smaller fragments in the aqueous environment thereby increasing the available surface area and promote more rapid release of drug substance [3, 4].

METHODOLOGY

Isolation and Purification of Aegle Marmelos (Bael Fruit) gum powder [5, 6]

Fresh pulpy parts of edible fruits of Aegle marmelos were soaked in distilled water and boiled for 2-3 hours in a water bath until slurry was formed. The slurry was cooled and kept in refrigerator overnight so that most of the un dissolved portion was settled out. The upper clear supernatant solution was decanted off and concentrated at 60ºC on a water bath until the volume reduced to its one third. Solution was cooled down to the room temperature and was poured into thrice the volume of acetone by continuous stirring. The precipitate was washed repeatedly with acetone and dried at 50ºC. The dried gum was powdered and stored in tightly closed container.

Preformulation Studies [7-10]

A Preformulation activity ranges from supporting discovery's identification of new active agents to characterizing physicochemical properties of the new compound that could affect the drug performance and development of an efficacious dosage form. Preformulation studies describes as the process of optimizing the delivery of drug through the determination of physico-chemical properties of the new compound that could affect the drug performance and development of an efficacy, stable and safe dosage form. It is necessary to study the following physicochemical properties of the bulk drug like Physical appearance, Solubility, Bulk density, tapped density and compressibility Index, Flow properties, Drug - Excipients compatibility studies.

Organoleptic Properties of Drug

Colour

A small amount of powder was taken in butter paper and Diclofenac sodium was viewed in well illuminated place.

Odour & Taste

Less quantity of drug was used to get taste with the help of tongue as well as smelled to get the odour.

Determination of Melting Point

Melting point was determined by taking small amount of drug in a capillary tube closed at one end. The capillary tube was placed in an electrically operated melting point and the temperature at which the drug melts was recorded. This was performed thrice and average values were noted.

Solubility Analysis

Solubility can be determined by adding the solute in small incremental amount to fixed volume of the solvents. After each addition, the system is vigorously shaken and examined visually for any un-dissolved solute particles. Solubility of acid-based drug is pH dependent. It is determined over the pH range 1-8 then solubility was carried out by using the following formula by UV method,

$$\textbf{Solubility} = (A_t/A_s) \times C_s \times (D_t/W_d \times 1000)$$

Where A_t is the Sample (test) absorbance
A_s is the Standard absorbance
C_s is the standard concentration of drug
D_t is the dilution factor
W_d is the Weight of the drug

Supersaturated solutions of Diclofenac sodium drug with water, 0.1N HCl, Phosphate buffer-p^H6.4,Phosphate buffer-p^H-6.8, Phosphate buffer-p^H-7.2 were prepared and absorbance was measured at 285nm and the results were given in Table 7.

Pre Compression Evaluation Parameters

Bulk density

Bulk density of a powder is the ratio of mass of the powder to the Bulk volume.Bulk density was determined by pouring pre sieved (Sieve No. 40) powder into a graduated cylinder via a large funnel and volume and weight was measured. Bulk density was measured by using formula

$$\textbf{P} = \textbf{m}/\textbf{V}_o$$

Where,
P = Bulk density
m = Mass of the Powder
V_o= Untapped Volume

Tapped Density

The tapped density is measured for two primary purposes

a) The tapped value is more reproducibly measured than the bulk value
b) The "flowability" of a powder is inferred from the ratio of these two measured densities.

Weighed quantity of powder was taken into graduated cylinder, volume occupied by API was noted down. Then cylinder was subjected to 100 taps in tapped density tester (Electro Lab USP - II), the % Volume variation was calculated by following form.

$$\textbf{P}_t = \textbf{m}/\textbf{V}_i$$

Where,
P_t = Tapped density
m = Mass of the powder
V_i= Tapped volume

Carr's compressibility Index

Compressibility is the ability of powder to decrease in volume under pressure. Using untapped density and tapped density the percentage compressibility of powder was determined, which was given as Carr's compressibility index.

$$\textbf{CI} = \textbf{V}_i\textbf{-V}_0 / \textbf{V}_i \times 100$$

Where,
CI = Compressibility index
Vo = Bulk density
V_i = Tapped density

Hausner Ratio

It is the measurement of frictional resistance of the drug. It was determined by the ratio of tapped density and bulk density. Hausner Ratio was measured by using formula,

$$\textbf{Hausner Ratio} = \textbf{V}_i/\textbf{Vo}$$

Where,
Vo = Bulk density

V_i = Tapped density

Angle of repose (θ)

Angle of repose is the maximum angle that can be obtained between the freestanding surface of the powder heap and the horizontal plane. It is a characteristic related to the inter particulate friction or resistance to movement between particles. Angle of repose of different formulations was measured according to fixed height funnel standing method. The method used to find the angle of response is to pour the powder in the form of a conical heap on a flat surface and measure the inclined angled with the horizontal pile.

$$\tan \theta = h / r$$

$$\theta = \tan^{-1} (h / r)$$

Where, h = height of pile

r = radius of the base of the pile

θ = angle of repose

a) The lower the angle of repose, the better the flow property.
b) Rough and irregular surface of particles gives higher angle of repose.
c) Decreased in the particle size leads to a higher angle of repose.

Procedure

Weighed quantity of Powder was passed through a funnel kept at a height of 2 cm for the base. The powder is passed till it forms heap and touches the tip of the funnel. The radius was measured and angle of repose was calculated by using the above mentioned formula.

Table 1: Flow Properties and Corresponding Angle of Repose, Compressibility index, Hausner ratio

Flow characters	Compressibility index (%)	Hausner ratio	Angle of repose (θ)
Excellent	< 10	2.00 - 1.12	25-30
Good	11-15	1.12 – 1.18	31-35
Fair	16-20	1.19 – 1.25	36-40
Passable	21-25	1.26 – 1.34	41-45
Poor	26-31	1.35 – 1.45	46-55
Very poor	32-37	1.46 – 1.59	56-65
Very Very poor	> 38	> 1.60	> 66

Drug Excipient Compatibility Studies

Fourier Transform Infrared Spectroscopy (FT-IR)

The objective of drug/excipient compatibility considerations and practical studies was to delineate, as quickly as possible, real and possible interactions between potential formulation excipients and the API. Homogenous mixtures of drug and excipients were prepared and filled in glass vials. Samples packed in glass vials were maintained at 60± 2°C for 2 weeks

Potassium bromide was mixed with drug and/or polymer in 9:1 ratio and the spectra were taken. FT-IR spectrum of Diclofenac sodium was compared with FT-IR spectrum of Diclofenac sodium with polymer/excipients. Disappearance of Diclofenac sodium peaks or shifting of peaks in any of the spectra was studied.

Calibration Curve of Diclofenac Sodium

Standard Stock Solution Preparation

Accurately weighed 100 mg of drug (Diclofenac sodium) was first dissolved 100 ml of Phosphate buffer p^H- 6.8 in 100 ml of volumetric flask and to make a concentration of 1000 µg/ml (Primary stock solution).From the primary stock solution to make a concentration of 100µg/ml(secondary stock solution).

Sample Preparation

From the secondary stock solution, to make concentrations from 1 to 10 µg/ml were prepared by using Phosphate buffer p^H - 6.8 solution for calibration curve. Standard Calibration curve was plotted by taking absorbance in UV double beam spectrophotometer at 285 nm.

Formulation and Development of Diclofenac sodium Fast Disintegrating Tablets by using Direct Compression method

Step 1: All the ingredients- Diclofenac sodium, Disintegrating agents and lactose have been weighed individually into separate poly bags.

Step 2: These ingredients are then sifted through sieve no. 40 and blended together in a poly bag for 10 min.

Step 3: Lubrication-Weighed amount Magnesium Stearate sieved through mesh sieve no. 60 were added to the above blend and blending was carried out for 5 more min.

Step 4: Compression-The lubricated blend is compressed using punch toolings.

Upper punch: Plain Lower punch: Plain.

Step 5: Description of core tablets:

White and Oblong biconvex tablet plain on both sides.

Table 2: List of Formulations

S.No	Name of the ingredient(mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
1	Diclofenac sodium	50	50	50	50	50	50	50	50	50	50	50	50
2	Sodium Starch Glycolate	4	8	12	16	-	-	-	-	-	-	-	-
3	Crosspovidone	-	-	-	-	4	8	12	16	-	-	-	-
4	Aegle marmelos	-	-	-	-	-	-	-	-	4	8	12	16
5	Magnesium stearate	2	2	2	2	2	2	2	2	2	2	2	2
6	Talc	2	2	2	2	2	2	2	2	2	2	2	2
7	Lactose	142	138	134	130	142	138	134	130	142	138	134	130
8	Total weight(mg)	200	200	200	200	200	200	200	200	200	200	200	200

***In-vitro* Evaluation tests for Diclofenac Sodium Fast Disintegrating Tablets [11-19]**

General appearance

The formulated tablets were assessed for its general appearance and observations were made for shape, colour, texture and odour.

Thickness

Thickness mainly depends up on die filling, physical properties of material to be compressed under compression force. The thickness of the tablets was measured by using Digital Vernier Calipers.

Desired thickness: **2.0 - 4.0 mm**

Hardness

Hardness of the tablet is defined as the force required in breaking a tablet in a diametric compression test. In this test, a tablet was placed between two anvils, force was applied to the anvils and the crushing strength that just causes the tablet to break is recorded. Hence hardness is sometimes referred to as Crushing Strength. Tablets require certain amount of strength or hardness to withstand mechanical shocks of handling in manufacture, packaging and shipping. At a constant compression force (fixed distance between upper and lower punches), hardness increases with increasing die fills and decreases with lower die fills.

Desired hardness: **4-12 Kg/cm^2**

Friability

Friability is defined as the loss in weight of tablet in the container due to removal of fine particle from their surface. It is expressed in percentage (%). A preweighed tablet sample (20 tablets) was placed in the friabilator chamber and rotated for 10 revolutions. In each revolution the tablets are carried up and are allowed to freely fall from a height of 6 inches. After 100 revolutions the tablets are removed from the chamber, dusted and reweighed. When capping is observed during friability test, tablets should not be considered acceptable, regardless of percentage weight loss.

% Friability was then calculated using the following formula:

Friability = [(Initial wt – Final wt)/ Initial wt] X 100

Limit: Friability should be less than 1%

Weight Variation

Individually weighed 20 tablets and calculate the average weight not more than two of the individual weights deviate from the average weight by more than the percentage deviation shown in Table 3 and more deviated by more than twice that percentage.

$$\text{Percentage deviation} = \frac{[\text{Weight of tablet (mg)} - \text{Average weight of tablet (mg)}]}{\text{Average weight of tablet (mg)}} \times 100$$

Table 3: Limits for weight variation

Average weight of Tablets (mg)		**Maximum Percentage deviation (%)**
IP	**USP**	
130 or less	80 or less	10
130 – 324	80-250	7.5
324 or more	250 or more	5.0

Disintegration Test

The process of breakdown a tablet into smaller particles is called as disintegration. The *in vitro* disintegration time of a tablet was determined using disintegration test apparatus as per IP specifications. Place one tablet in each of the 6 tubes of the basket.

Add a disc to each tube and run the apparatus using 0.1 N Hcl or Phosphate buffer P^H 6.8 as the immersion liquid and maintained a temperature at $37^o\pm 2\ ^oc$. The time in seconds taken for complete disintegration of the tablet with no palpable mass remaining in the apparatus was measured and recorded.

Content uniformity

Weigh and powder 20 tablets. Weigh accurately a quantity of the powder equivalent to 50mg of diclofenac sodium, shake with 60ml of methanol in a 200ml clean, dry volumetric flask and dilute to volume with methanol and sonicate for 30 minutes with intermittent shaking at room temperature. Dilute 5ml of this solution to 100ml with methanol. Centrifuge the solution at 10,000 RPM for 10 minutes. Filter through 0.45µ nylon membrane filter .To measure the absorbance at 285nm.

Assay = (At/As)×Cs× (Dt/Wd) ×100

Where

A_t is the Sample (test) absorbance.

A_s is the Standard absorbance.

C_s is the standard concentration of drug.

D_t is the dilution factor.

W_d is the Weight of the drug.

Wetting Time

This test was carried out by to measure the time required for the complete wetting of tablet formulations. A piece of tissue paper folded twice was placed in small petridish containing 10ml of water in which amaranth, a water-soluble dye was added. A tablet was placed on this paper. The time required for water to reach the upper surface of the tablet was noted as wetting time.

***In-Vitro* drug release study**

Preparation of Dissolution Medium (Phosphate buffer P^H- 6.8)

Dissolve 28.80gm of Disodium hydrogen phosphate and 11.45gm of Potassium dihydrogen phosphate dissolved in 1Lt of distilled water and sonicated for 10-15 min. The drug release rate of Diclofenac sodium fast disintegrating tablets was determined using United States Pharmacopeia (USP) dissolution testing apparatus type 2 (paddle method).The dissolution test was performed by using 900 ml of Phosphate buffer pH- 6.8, at $37^0\pm 0.5^0$ C and 50 rpm. In specified time intervals an aliquot of 5ml samples of the solution were withdrawn from the dissolution apparatus and with replacement of fresh fluid to dissolution medium. The samples were filtered through filter paper of 0.45 µ m. Absorbance of these solutions were measure data λmax 285 nm using by using UV/Visible Spectrophotometer. The drug release was plotted against time to determine the release profile of various formulations.

The % drug release of the formulation can be calculated by

% drug release = (At/As) ×Cs× (Dt ×Vm/Wd×1000) ×100

Where A_t is the Sample (test) absorbance.

A_s is the Standard absorbance.

C_s is the standard concentration of drug.

D_t is the dilution factor.

$W_d$is the Weight of the drug.

V_m is the volume of the dissolution medium

Table 4: Dissolution Parameters

Dissolution medium	Phosphate buffer p^H- 6.8
Dissolution medium volume	900ml
Apparatus	USP-II(Paddle type)
Speed of paddle rotation	50 rpm
Temperature	$37^0\pm 0.50$ C
Volume of samples withdrawn	5 ml
Sampling time interval(Min)	5,10,15,20,25,30,40,50
Measurement of absorbance	285nm

***In-Vitro* Release Kinetics Studies**

The analysis of drug release mechanism from a pharmaceutical dosage form is Important but complicated process and is practically evident in the case of matrix systems. The order of drug release from fast disintegrating tablets was described by using zero order kinetics or first order kinetics.

Zero Order Release Kinetics

It defines a linear relationship between the fractions of drug released versus time.

$Q=k_o\ t$.

Where, Q is the fraction of drug released at time t.

Ko is the zero order release rate constant.

A plot of the fraction of % of drug released against time (Min) will be linear if the release obeys zero order release kinetics.

First order release kinetics

Wagner assuming that the exposed surface area of a tablet decreased exponentially with time during dissolution process suggested that the drug release from most of the slow release tablets could be described adequately by the first-order kinetics. The equation that describes first order kinetics is

Log C= Log C0-kt/2.303

Where C is the amount of drug dissolved at time t,
Co is the amount of drug dissolved at t=0 and
k_t is the first order rate constant

A graph of log cumulative of log % drug remaining Vs time yields a straight line. It will be linear if the release obeys the first order release kinetics.

Method for comparison of Dissolution Profile [20]

A model-independent method for comparison of two dissolution profiles is based on determination of **difference factor f_1**and **similarity factor f_2** which are calculated using the formulae-

$$f_1 = \frac{\sum_{t=1}^{n} (R_t - T_t)}{\sum_{t=1}^{n} R_t} 100$$

$$f_2 = 50 \log \left\{ \left[1 + \frac{1}{n} \sum_{t=1}^{n} (R_t - T_t)^2 \right]^{-0.5} 100 \right\}$$

Where n = Number of dissolution time points

R_t = Dissolution value of the reference drug product at time t

T_t = Dissolution value of the test drug product at time t

Table 5: Comparison of Dissolution Profile

Difference factor(f_1)	Similarity factor (f_2)	Inference
0	100	Dissolution profiles are identical
≤15	≥50	Similarity or equivalence of two profiles

RESULTS

Preformulation Studies

Characterization of API

Table 6: API Characteristics

S. No	CHARACTERISTICS	RESULTS
1.	Description	white to off-white crystalline Powder
2.	Melting Point	284 ± 0.43° C
3.	Bulk Density	0.602±0.47gm/ml
4.	Tapped Density	0.687±0.47gm/ml
5.	Carr's Index	13.48 ±0.47%
6.	Hausner's Ratio	1.14 ±0.47
7.	Angle of Repose	32° ±0.47

Solubility Analysis

Table 7: Solubility Analysis of Diclofenac sodium with different solvents

S.No	Type of solvent	Solubility(mg/ml)
1	Water	0.070±0.021
2	0.1N Hcl	0.645±0.009
3	Phosphate buffer p^H-6.4	0.516±0.014
4	Phosphate buffer p^H-6.8	0.958±0.014
5	Phosphate buffer p^H-7.2	0.731±0.049

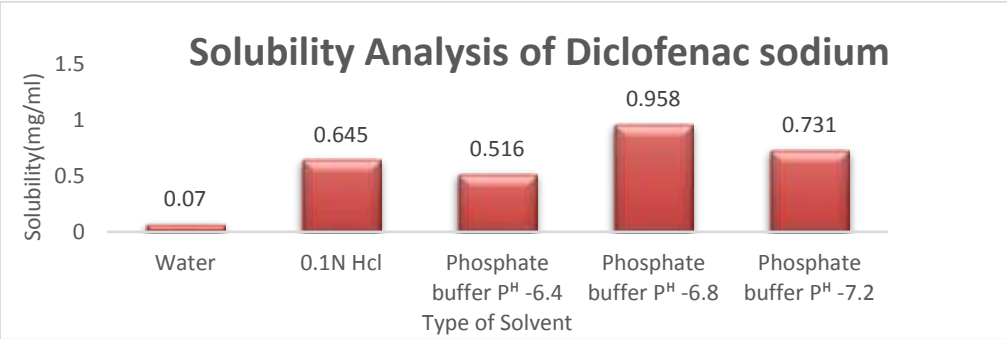

Fig 1: Solubility Analysis of Diclofenac sodium with different solvents

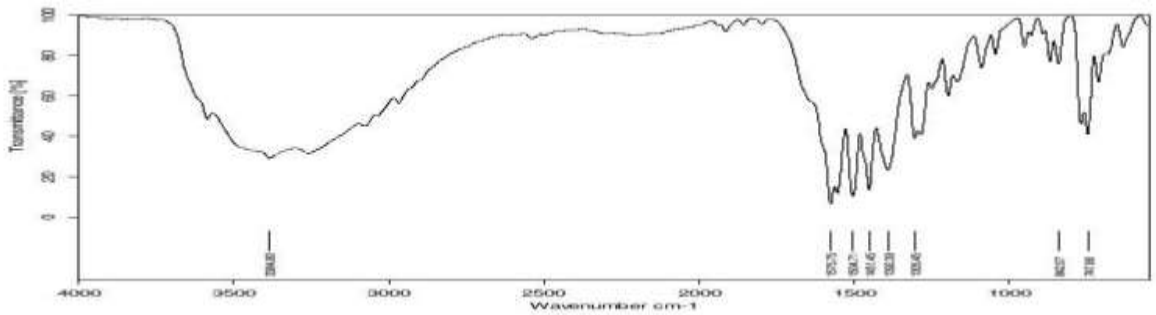

Fig 2: FT-IR Spectra of Diclofenac sodium

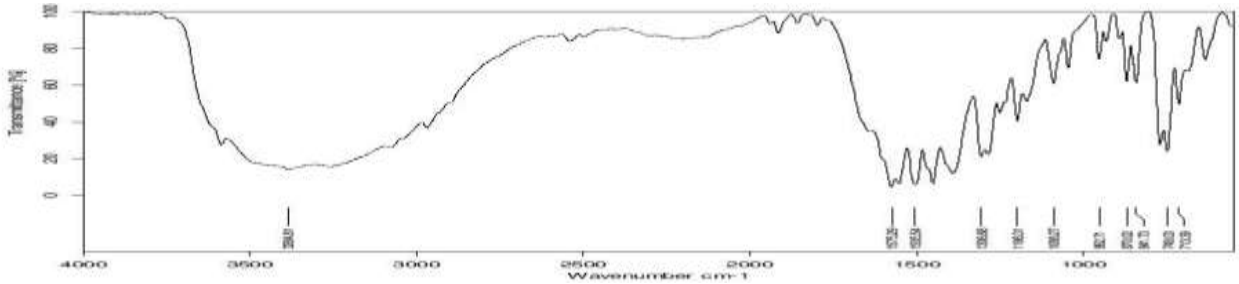

Fig 3: FT-IR Spectra of Optimized Formulation (F12)

Table 8: Standard Calibration Curve Data of Diclofenac sodium

S.No	Concentration(µg/ml)	Absorbance at 285nm
1	0	0
2	1	0.093±0.012
3	2	0.194±0.020
4	3	0.295±0.007
5	4	0.399±0.015
6	5	0.501±0.028
7	6	0.602±0.009
8	7	0.706±0.007
9	8	0.801±0.003
10	9	0.902±0.011
11	10	0.988±0.005

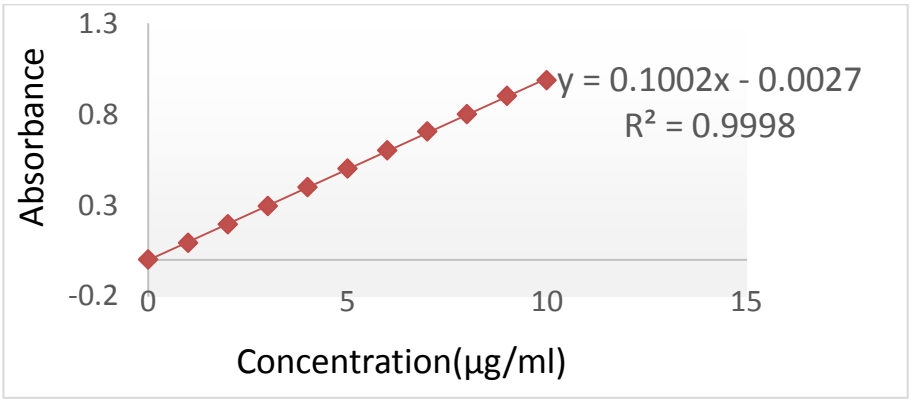

Fig 4: Standard Calibration curve of Diclofenac sodium

Table 9: Evaluation of Diclofenac sodium FD tablets

Formulations	Weight variation (mg)	Thickness (mm)	Hardness (Kg/cm^2)	Friability (%)	Assay (%)	Disintegration time (sec)	Wetting time(sec)
F1	199.2	2.86±0.15	4.74±0.41	0.68±0.07	100.28±0.14	174±0.52	48±0.38
F2	199.5	2.90±0.22	4.85±0.21	0.68±0.07	99.53±0.17	148±0.12	45±0.13
F3	199.3	2.96±0.27	4.92±0.10	0.72±0.45	99.64±0.21	104±0.68	39±0.87
F4	200	2.79±0.45	4.96±0.10	0.74±0.14	99.13±0.17	59±0.42	38±0.49
F5	199.01	2.94±0.16	4.50±0.14	0.75±0.54	100.23±0.22	160±0.32	45±0.46
F6	200.2	2.97±0.32	4.62±0.07	0.72±0.21	99.86±0.09	123±0.58	40±0.84
F7	200	2.76±0.17	4.48±0.27	0.65±0.44	99.68±0.27	98±0.67	38±0.59
F8	199.4	2.80±0.22	4.56±0.04	0.62±0.21	100.07±0.47	50±0.43	35±0.36
F9	199.03	2.92±0.17	4.55±0.27	0.60±0.04	100.32±0.25	151±0.87	39±0.74
F10	199.8	2.90±0.34	4.80±0.25	0.82±0.10	99.75±0.32	120±0.34	37±0.45
F11	200.03	2.72±0.30	4.62±0.15	0.74±0.26	100.02±0.44	95±0.75	31±0.96
F12	200.01	2.92±0.31	4.42±0.14	0.67±0.43	100.87±0.35	45±0.36	20±0.45

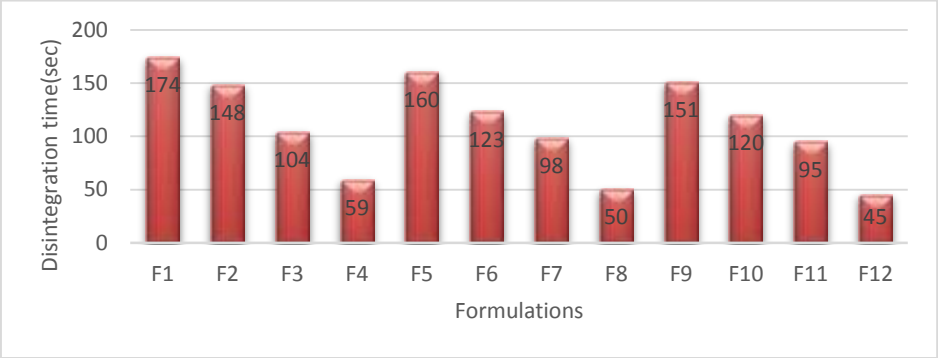

Fig 5: Disintegration time of Formulations (F1-F12)

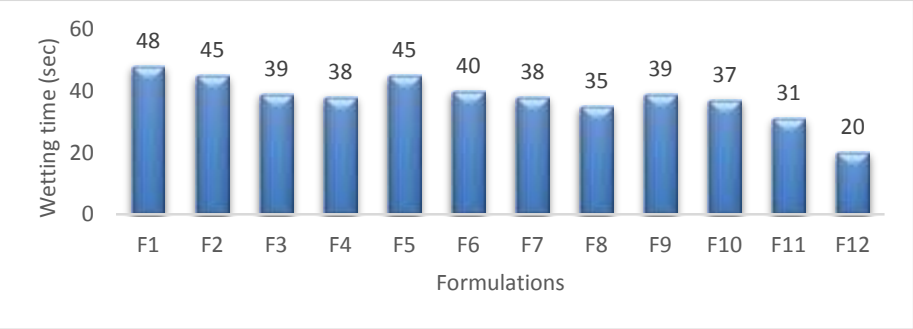

Fig 6: Wetting time of Formulations (F1-F12)

***In - vitro* Dissolution Studies**

Table 10: Dissolution profiles of Formulations (F1 to F4)

Time (min)	% DRUG RELEASE			
	F1	F2	F3	F4
0	0	0	0	0
5	10.13±0.17	11.69±0.45	14.69±0.47	17.15±0.99
10	25.33±0.15	27.10±0.85	28.43±0.25	32.3±1.48
15	38.41±0.21	40.31±0.96	45.01±0.76	58.13±0.66
20	50.06±0.57	55.13±0.11	58.48±0.65	72.05±0.45
25	68.17±0.25	63.49±0.05	67.38±0.87	86.65±0.85
30	80.29±1021	79.27±0.17	81.44±0.57	99.17±0.44
40	92.08±0.85	98.77±0.58	99.13±0.83	
50	98.03±0.35			

Table 11: Dissolution profiles of Formulations (F5 to F8)

Time (min)	% DRUG RELEASE			
	F5	F6	F7	F8
0	0	0	0	0
5	11.10±0.58	13.79±0.75	16.49±0.12	20.16±0.15
10	27.03±0.25	29.41±0.53	32.11±0.53	35.47±0.68
15	40.27±0.85	42.35±0.46	48.17±0.96	61.23±0.87
20	56.16±0.43	58.27±0.31	60.93±0.36	79.62±0.25
25	70.29±0.70	68.71±0.43	71.27±0.74	88.02±0.78
30	83.4±0.73	81.13±0.58	83.10±0.43	99.23±0.21
40	91.25±0.14	99.02±0.32	99.14±0.69	
50	98.91±0.29			

Table 12: Dissolution profiles of Formulations (F9 to F12)

Time (min)	% DRUG RELEASE			
	F9	F10	F11	F12
0	0	0	0	0
5	11.14±0.55	15.13±0.85	17.41±0.96	21.43±0.57
10	19.27±0.36	23.21±0.69	27.31±0.54	39.47±0.69
15	27.31±0.58	35.14±0.07	49.27±0.34	68.21±0.43
20	39.43±0.61	49.43±0.59	74.13±0.05	89.55±0.53
25	58.07±0.29	75.11±0.20	87.02±0.74	**99.97±0.19**
30	69.29±0.74	87.61±0.09	99.47±0.68	
40	83.26±0.09	98.83±0.89		
50	98.11±0.68			

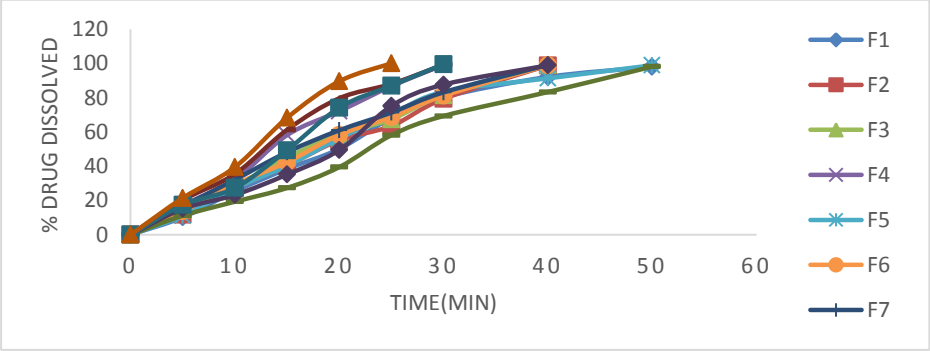

Fig 7: Dissolution graphs of 12 formulations

Drug release kinetics of F12 formulation (Optimized)

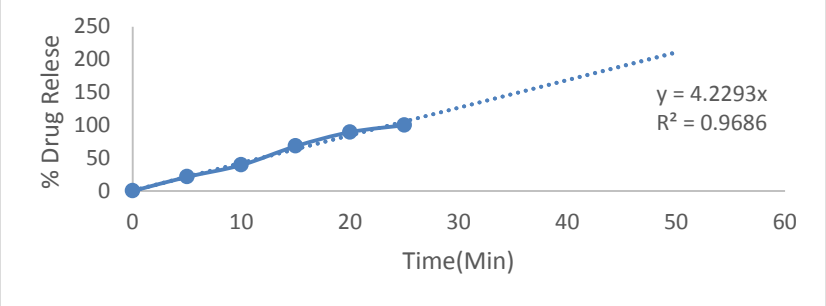

Fig 8: Zero order kinetics of optimized formulation (F12)

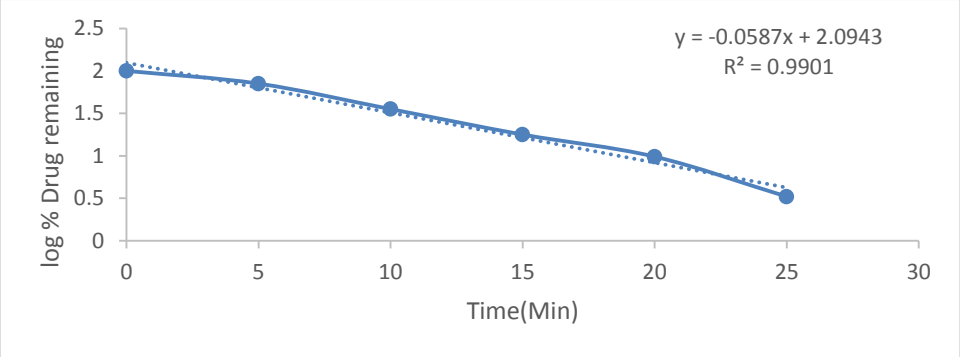

Fig 9: First order kinetics of optimized formulation (F12)

Table 13: Drug release kinetics of F12 formulation (Optimized) and Marketed Formulation (Branded drug)
Brand name: Voveran

Time (min)	BRANDED DRUG	F12
0	0	0
5	20.23	21.43
10	35.49	39.47
15	69.23	68.21
20	90.05	89.55
25	**99.02**	**99.97**

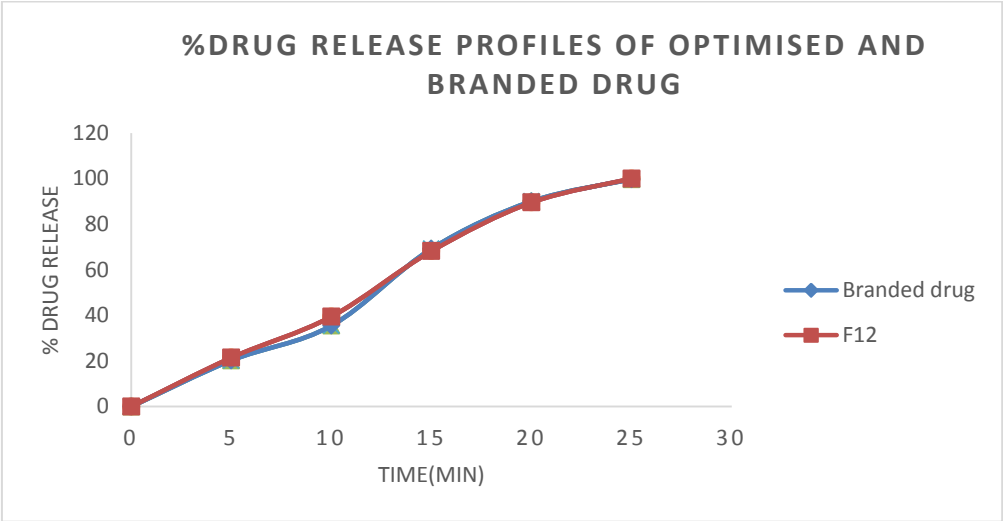

Fig 10: Dissolution graphs of Optimized formulation and Branded drug

CONCLUSION

As the ratio of polymer increased then the Disintegration time was decreased. Among all the 12 formulations the"F12" formulation [(Diclofenac sodium): Aegle marmelos (8%W/W)] showed less disintegration time and better drug release when compared to other formulations based on the % drug release correlation coefficient value and similarity factor(f2). *In-Vitro* dissolution studies showed 99.97% of drug release within 25 minutes and the mechanism of drug release from the FDT was followed to be First order kinetics.

Comparison of drug release profiles of the fast disintegrating tablets prepared by using SSG, Crosspovidone and Aegle marmelos(Bael Fruit) and Commercial Brand indicated that the release profile of Optimized formulation (F12) showed similarity to the Branded drug (Voveran) tablets based on the similarity factor(f2) value.

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