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Research Article

FORMULATE AND EVALUATE DISPERSIBLE TABLET OF ACECLOFENAC FOR ENHANCEMENT OF BIOAVAILABILITY

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ABSTRACT

The solubility was carried out in different solvents like methanol, ethanol and water. A pinch of drug was added into separate test tubes, containing 5 ml of each solvent. All the test tubes were shaken for 5-10 min. The UV absorbances of the solutions after appropriate dilutions were determined at 273 nm aceclofenac respectively (Shimadzu-1700 UV-visible spectrophotometer). Solutions of aceclofenac were prepared in the different dissolution medium and organic solvents. λ_{max} was determined by scanning between 200-400 nm, using Shimadzu spectrophotometer. Capillary fusion method was used to determine the melting point of aceclofenac. The IR analysis of the sample was carried out for qualitative compound identification.Dispersible tablet of Aceclofenac was formulated using 2 % and 4 % of disintegrants Crospovidone, Sodium starch glycolate, Guar gum and Ispaghula by conventional dry granulation. Tablets were made from blends by direct compression, dry granulation and wet granulation methods. The quality of tablet, once formulated by rule, is generally dictated by the quality of physicochemical properties of blends. Twenty tablets were selected in a batch for the determination of thickness variation with Vernier Caliper. The weight of the tablet was measured with the help of digital electronic balance Hardness of tablet was determined using Pfizer tester. Friability of the tablets was determined using Roche friabilator. *In vitro* dispersion time was measured by dropping a tablet in a measuring cylinder containing 6 ml of water. Three tablets from each formulation were randomly selected and *in vitro* dispersion time was performed, the time that takes a tablet to disintegrate is measured by USP/ NF devices which contained glass tubes that are three inches long open at the top and held against a 10 mesh screen at the bottom end of the basket rack assembly. *In vitro* dissolution studies for all the fabricated tablets, marketed formulation and pure drug was carried out using USP paddle method at 75 rpm in 900 ml of phosphate buffer pH 7.0 as dissolution media, maintained at 37° ± 0.5.

KEY WORDS: Aceclofenac, Dispersible tablet, *In vitro* dispersion time, dry granulation, wet granulation

1. INTRODUCTION:

Dispersible tablets are uncoated tablets intended to be dispersed in water before administration giving a homogeneous dispersion[31-33]. Typically a dispersible tablet is dispersed in about 5-15 ml of water and the resulting dispersion is administered to the patient. Dispersible tablets are required to disintegrate within 3 min in water at 15-25°. Also the dispersion produced from a dispersible tablet should pass through a sieve screen with a nominal mesh aperture of 710 micron. It is also known as "kid tablet". They have number of advantages over the other tablets and suitable for fast dissolution and absorption of those drugs which are poorly soluble in water.[1-3]

1.1 Wet granulation: Wet granulation is the process of adding a liquid solution to powders to form granules. The process can be very simple or very complex depending on the characteristics of the powders. The liquid solution can be either aqueous based or solvent based (dries). Once the solvent has been dried and the powders have formed a more densely held mass, then the granulation is milled. This process results in the formation of granules. It is a commonly used unit operation in the pharmaceutical industry.[4]

1.2 Dry granulation: The dry granulation process is used to form granules without using a liquid solution because the product to be granulated may be sensitive to moisture and heat. Forming granules without moisture requires compacting and densifying the powders. Dry granulation can be conducted on a tablet press using slugging tooling or on a roller compactor commonly referred to as a *chilsonator*. When a tablet press is used for dry granulation, the powders may not possess enough natural flow to feed the product uniformly into the die cavity, resulting in dry granulator is used to granulate slugs of active pharmaceutical ingredients and other materials into uniform size of granules.[5]

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2. EXPERIMANTAL WORK:

Table 2.1: Instruments used

Sr. No.	Name	Manufacturer Name
1	Melting Point Apparatus	Remi Instrument, Mumbai
2	Digital Weighing Balance	Shimadzu
3	UV Spectrophotometer	Shimadzu-1700 spectrophotometer
4	InfraRed Spectrophotometer	Shimadzu-470 spectrophotometer
5	Tablet Punching Machine	Cad mach, Ahmedabad
6	pHmeter	Control dynamic pHmeter
7	Hardness Tester	Scientific Engineering Co. Ltd., Delhi
8	Friabilator	Campbell Electronics, Mumbai
9	Disintegrator	Campbell Electronics, Mumbai
10	Hot-Air Oven	Narang Scientific Works (P). Ltd, Delhi
11	Dissolution Apparatus IP/BP/USP six stage	Labindia 2000
12	Water bath shaker	Narang Scientific NSW-128 India

Table 2.2: Materials used

S. No.	Name	Manufacturer
1	Aceclofenac	Gift Sample from G. D. Lab. Pvt.Ltd., New Delhi
2	Crospovidone	Signet Chemicals Pvt. Ltd., Mumbai
3	Sodium Starch Glycolate	Signet Chemicals Pvt. Ltd., Mumbai
4	Guar Gum	Central Drug House Pvt Ltd., Mumbai
5	Ispaghula	Central Drug House Pvt Ltd., Mumbai
6	Avicel pH 102	Signet Chemicals Pvt. Ltd., Mumbai
7	Magnesium Stearate	Loba Chemie Pvt. Ltd., Mumbai
8	Starch	Loba Chemie Pvt. Ltd., Mumbai
9	Talc	Central Drug House Pvt Ltd., Mumbai
10	Potassium Dihydrogen Phosphate	E.Merck (India) Ltd., Mumbai
11	Sodium Hydroxide	E.Merck (India) Ltd., Mumbai
12	n-Octanol	E.Merck (India) Ltd., Mumbai
13	Methanol AR	Central Drug House Pvt Ltd., Mumbai
14	Acetone LR	E.Merck (India) Ltd., Mumbai
15	Aluminium Foil	Hindalco Industries Ltd., Silvasa
16	Talc	Loba Chemie Pvt. Ltd., Mumbai

2.1SOLUBILITY OF ACECLOFENAC

2.1.1 Qualitative Solubility of Aceclofenac in different solvents

The solubility was carried out in different solvents like methanol, ethanol and water. A pinch of drug was added into separate test tubes, containing 5 ml of each solvent. All the test tubes were shaken for 5-10 min. The solubility of aceclofenac was visually determined and following results were obtained.[6-9]

Table 2.3: Qualitative Solubility of Aceclofenac in Different Solvents at Room Temperature

Sr. No.	Solvents	Solubility
1	Purified Water	-
2	Methanol	+
3	Ethanol	+
4	Acetone	+
5	Dimethylformamide	!
6	HCl pH 1.2	-
7	Phosphate buffer pH 7.0	+
8	Phosphate buffer pH 7.4	!

(-) Insoluble, (+) Soluble, (!) Freely soluble

2.1.2 Quantitative Solubility of Aceclofenac in different solvents at room temperature

The solubility of aceclofenac was tested in various media. A definite quantity (10 mg) of drug was dissolved in 10 ml of each investigated solvents and different pH buffers in 25 ml volumetric flasks. All the solutions were diluted as required to get solutions of 40 µg/ml each. The mouth of each flask was properly covered with aluminium foil and placed in water bath shaker maintained at 37° for 24 h, then shaker was switched off and temperature of bath was maintained again for 12 h. This was done to avoid forced solubility due to shaking. Samples were taken manually and filtered, The UV absorbances of the solutions after appropriate dilutions were determined at 273 nm aceclofenac respectively (Shimadzu-1700 UV-visible spectrophotometer), and the amount of drug dissolved was calculated using respective calibration curve.[10-13]

Table 2.4: Quantitative Solubility of Aceclofenac in Different Media

S. No	Media	Solubility (mg/ml)
1	Water	0.218
2	HCl (pH 1.2)	0.361
3	Phosphate buffer pH 7.0	0.745

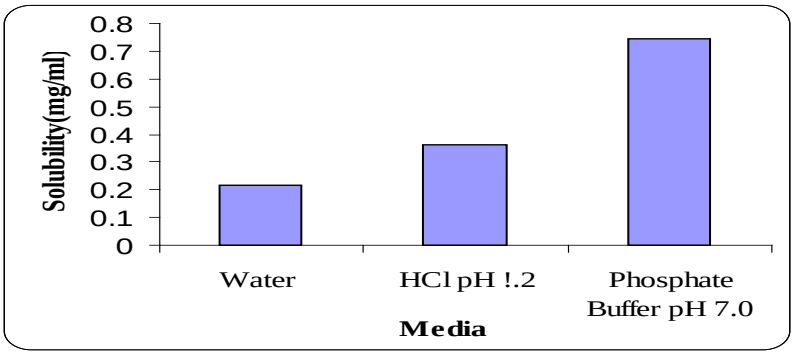

Fig 2.1: Quantitative Solubility of Aceclofenac in Different Media

2.1.3 Identification Test of Drug

It was dissolved about 10 mg in 10 ml of alcohol R. To 1 ml of the solution, added 0.2 ml of a mixture, prepared immediately before use, of equal volumes of a 6 g/l solution of potassium ferricyanide R and a 9 g/l solution of ferric chloride R and allowed to stand protected from light for 5 min. Added 3 ml of a 10.0 g/l solution of hydrochloric acid R. Allowed to stand protected from light for 15 min and blue colour develops and a precipitate was formed.[14-17]

2.1.4 Determination of λ_{max} for Analysis: Solutions of aceclofenac were prepared in the different dissolution medium and organic solvents. λ_{max} was determined by scanning between 200-400 nm, using Shimadzu spectrophotometer. The scanned λ_{max} was compared with literature value. λ_{max} were shown in Table 5.3 and scanning of Aceclofenac was shown in Fig.2.2.[18]

Table 2.5 λ_{max} of Aceclofenac in Different Dissolution Medium and in Organic Solvents

Sr. No.	Solvents	λmax (nm)
1	Methanol + water	274
2	Methanol	274
3	Phosphate buffer (pH 7.0)	274
4	Methanol + 0.1 N HCl	274

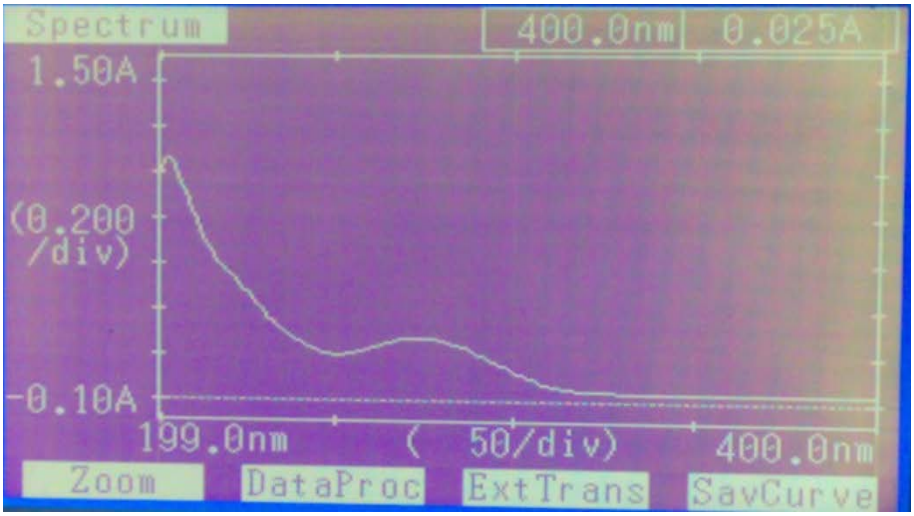

Fig 2.2Scan of λ_{max} (nm) of Aceclofenac in Methanol

2.1.5 Partition coefficient study: Equal volume of n-octanol and double distilled water were saturated for a period of 24 h. 10 mg of aceclofenac was added to the mixture and was agitated for 1 h. Water phase was then diluted suitably and absorbance was taken at λ_{max} 274 (nm). Partition coefficient was calculated as the ratio of drug concentration in n-octanol to that in the water using equation**$P_{o/w}$= (C_{Oil} / C $_{water}$) equilibrium**. The partition value was calculated and compared with literature value[19].

Table 2.6: Partition Coefficient Values of Aceclofenac in n-Octanol : Distilled Water

Medium	Experimental value	Literature value
Double distilled water	3.20	3.65

2.1.6 IR Spectroscopy: The IR analysis of the sample was carried out for qualitative compound identification. The pellet of approximately 0.1 mm diameter of the drug was prepared grinding 3-5 mg of sample with 100-150 mg of Potassium Bromide in pressure compression machine. The sample pellet was mounted in IR compartment and scanned at wavelength 4000 cm^{-1} – 500 cm^{-1}. The result was shown in Table 2.7.[20]

Table 2.7: Infrared Spectral Assignment of Aceclofenac

S.No.	Frequency	Vibration mode
1	1771.4, 1256, 1151	Ester
2	3317, 3269.6	Amide N-H Str.
3	3026.9	Aromatic C-H Str.
4	2936.2	Aliphatic C-H Str.
5	1716.4	Carboxylic -COOH
6	1508, 1590	Ring C=C Srt.
7	750	Trisubstituted Benzene Ring

2.2 CALIBRATION CURVE:

2.2.1 Calibration Curve of Aceclofenac in purified water

100 mg of Aceclofenac is dissolved in methanol and diluted to 100 ml with purified water. 10 ml of this stock solution was diluted to 100 ml with purified water. Prepared aliquots of Aceclofenac of 5, 10, 15, 20, 25, 30, 35 and 40 µg/ml from the stock solution in purified water. Absorbance was estimated by UV-visible spectrophotometer at 274 nm. Calibration data and calibration curve were shown in Table 2.8 and Fig.2.3 respectively.[21]

Table 2.8Calibration Data of Aceclofenac in Purified Water

S.No.	Conc. (µg/ml)	Absorbance
1	0	0.00
2	5	0.128
3	10	0.255
4	15	0.379
5	20	0.493
6	25	0.612
7	30	0.732
8	35	0.857
9	40	0.966

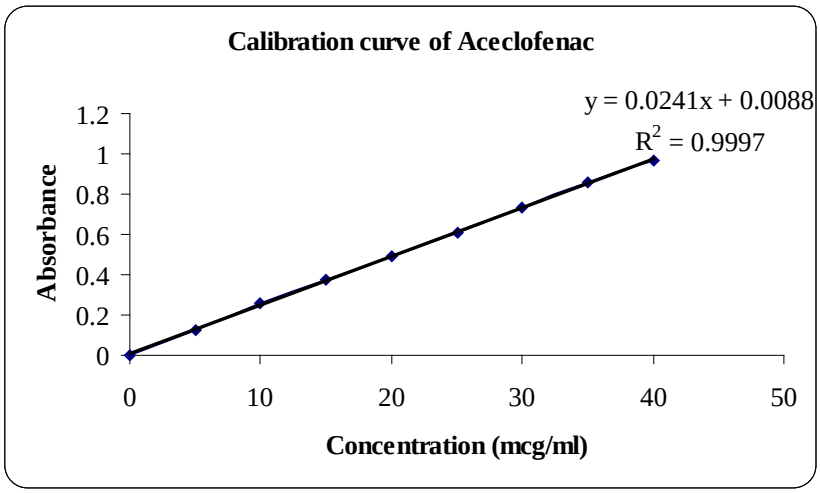

Fig 2.3: Calibration Curve of Aceclofenac in Purified Water

2.2.2Calibration Curve of Aceclofenac in HCl pH 1.2

Prepared stock solution of aceclofenac (100 µg/ml) in methanol. The aliquots of 5, 10, 15, 20, 25 and 30 µg/ml were prepared into 10 ml volumetric flask and volume was made up to 10 ml with HCl. The absorbances of these dilutions were determined at 274 nm. Calibration data and calibration curve were shown in Table 5.8 and Fig.2.4 respectively.[23-25]

Table 2.9: Calibration Data of Aceclofenac in HCl pH 1.2

S.No.	Conc. (mcg/ml)	Absorbance
1	0	0.00
2	5	0.138
3	10	0.274
4	15	0.439
5	20	0.605
6	25	0.725
7	30	0.875

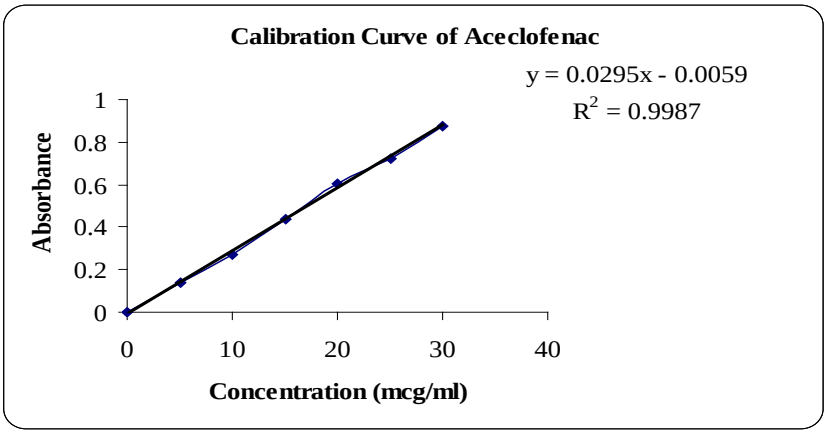

Fig.2.4: Calibration Curve of Aceclofenac in HCl pH 1.2

2.2.3 Calibration Curve of Aceclofenac in phosphate buffer of pH 7.0

Prepared stock solution of aceclofenac (100 µg/ml) in methanol. The aliquots of 5, 10, 15, 20, 25 and 30 µg/ml were prepared into 10 ml volumetric flask and volume was made up to 10 ml with phosphate buffer. The absorbances of these dilutions were determined at 274 nm. Calibration data and calibration curve were shown in Table 2.10 and Fig. 2.4 respectively.[25]

Table 2.10: Calibration Data of Aceclofenac in Phosphate Buffer (pH 7.0)

S.No.	Conc. (mcg/ml)	Absorbance
1	0	0.00
2	5	0.146
3	10	0.288
4	15	0.430
5	20	0.564
6	25	0.720
7	30	0.887

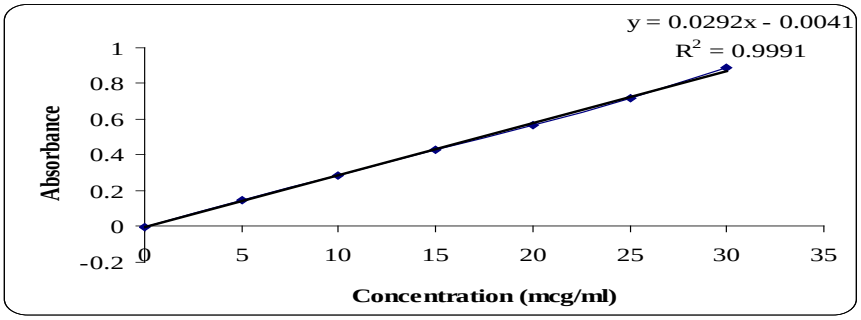

Fig.2.4: Calibration Curve of Acecofenac in Phosphate Buffer pH 7.0

Each value represents the mean ± S.D. (n=3)

3. RESULT AND DISCUSSION

3.1 PREPARATION OF DISPERSIBLE TABLETS

3.1.1 Direct Compression Method

In this method, tablets were compressed directly from the mixture of the drug and excipients without any preliminary treatment. The mixture to be compressed must have adequate flow properties and cohere under pressure thus making pre-treatment as wet granulation unnecessary. Formulation of tablets were shown in Table 3.1

Table 3.1: Formulation of Dispersible Tablets of Aceclofenac by Direct Compression

Ingredients	**A_1**	**A_2**	**A_3**	**A_4**	**A_5**	**A_6**	**A_7**	**A_8**
Aceclofenac	100	100	100	100	100	100	100	100
Crospovidone	5	10	-	-	-	-	-	-
SSG	-	-	5	10	-	-	-	-
Ispaghula	-	-	-	-	5	10	-	-
Guar gum	-	-	-	-	-	-	5	10
MCC(pH102)	125	120	125	120	125	120	125	120
Talc	10	10	10	10	10	10	10	10
Mag. Stearate	10	10	10	10	10	10	10	10

3.1.2 Dry Granulation

Dispersible tablet of Aceclofenac was formulated using 2 % and 4 % of disintegrants Crospovidone, Sodium starch glycolate, Guar gum and Ispaghula by conventional dry granulation. The disintegrants and other additives are mixed by milling and screening, prior to final compression of tablets. The initial blend of powder was forced into the dies of a long-capacity tablet requires and is compacted by means of flat faced punches roller compacter, the compacted masses were called slugs and the process was called as slugging. The long tablets (slugs) were converted in small pieces (milling) and formed small granules by screening (sieve-22). Mixed the glidant and lubricant in the granules. Pressure of the machine was adjusted in the range of 5-8 kg/cm^2. Formulations of tablets were shown in Table 3.2[26-29]

Table 3.2: Formulation of Dispersible Tablets of Aceclofenac by Dry Granulation

Ingredients	**A_9**	**A_{10}**	**A_{11}**	**A_{12}**	**A_{13}**	**A_{14}**	**A_{15}**	**A_{16}**
Aceclofenac	100	100	100	100	100	100	100	100
Crospovidone	5	10	-	-	-	-	-	-
SSG	-	-	5	10	-	-	-	-
Ispaghula	-	-	-	-	5	10	-	-
Guar gum	-	-	-	-	-	-	5	10
MCC	120	115	120	115	120	115	120	115
Starch	5	5	5	5	5	5	5	5
Talc	10	10	10	10	10	10	10	10
Mag. Stearate	10	10	10	10	10	10	10	10

3.1.3 Wet Granulation

A dispersible tablet of Aceclofenac was formulated using 2 % and 4 % of disintegrants Crospovidone, Sodium starch glycolate, Guar gum and Ispaghula used in the formulations. Wet granulation techniques employed for the preparation of tablets using 5 % of starch paste as binders. The wet screening process involves converting the moist mass into coarse, granular aggregates of passing through screen (sieve-22). Wet granules were dried slowly and forms hard aggregates. Dried granules were screened again and mixed talc and magnesium stearate. This material was compressed using Cadmach single punch tablet machine. Pressure of the machine was adjusted in the range of 5-8 kg/cm^2. Formulation of tablets were shown in Table 3.3[30]

Table 3.3: Formulation of Dispersible Tablets of Aceclofenac by Wet Granulation

Ingredients	**A_{17}**	**A_{18}**	**A_{19}**	**A_{20}**	**A_{21}**	**A_{22}**	**A_{23}**	**A_{24}**
Aceclofenac	100	100	100	100	100	100	100	100
Crospovidone	5	10	-	-	-	-	-	-
SSG	-	-	5	10	-	-	-	-
Ispaghula	-	-	-	-	5	10	-	-
Guar gum	-	-	-	-	-	-	5	10
MCC	120	115	120	115	120	115	120	115
Starch paste	5	5	5	5	5	5	5	5
Talc	10	10	10	10	10	10	10	10
Mag. Stearate	10	10	10	10	10	10	10	10

3.1.4*In vitro* dispersion time - *In vitro* dispersion time was measured by dropping a tablet in a measuring cylinder containing 6 ml of water. Three tablets from each formulation were randomly selected and *in vitro* dispersion time was performed. The data was shown in Table 3.4

3.1.5 Uniformity of dispersion-Uniformity of dispersion was determined by placing two tablets in 50 ml of purified water and stirrer until these tablets completely and uniformly dispersed in the media. A smooth dispersion of dispersible tablet was passed through a sieve screen of 22. The data was shown in Table 3.4

3.1.6 Wetting time-Wetting time of tablets was determined by a simple experiment, designed to estimate the water uptake of the formulated dispersible tablets. A glass petridish was partially filled with water and a tablet was placed on the surface of a glass side. The uptake of water reached from the lower surface of the tablet. The time required for water to reach the centre of the upper surface of tablet was noted as wetting time. The average of the three observation were shown in Table 3.5

3.1.7 Disintegration Test-Breaking of tablet into smaller particles or granules is known as disintegration. The time that takes a tablet to disintegrate is measured by USP/ NF devices which contained glass tubes that are three inches long open at the top and held against a 10 mesh screen at the bottom end of the basket rack assembly. For the test of disintegration time, one tablet is placed in each tube and the basket assembly is positioned in a 1l beaker which contained purified water at 25 ± 1°. A standard motor driven device moved the basket assembly containing the tablets up and down through a distance of 5 to 6 cm at a frequency of 28 to 32 cycles per minute.

To be in compliance with the USP / LP / BP standards, the dispersible tablets must disintegrate within 3 min when examined by the thermonic disintegration apparatus. Evaluation data were shown in Table 3.5 and graph shown in Fig.3.[32-37]

3.1.8 Content uniformity

Ten randomly selected tablets were weighed and average weight was calculated, the tablet were powdered in a glass mortar. The weight equivalent to 40 mg aceclofenac was weighed. The weighed amount was dissolved in 5 ml of methanol in separate volumetric flask using magnetic stirrer, the volume was adjusted to 100 ml with methanol and the solution was filtered. An aliquot of 5 ml from these solution were diluted to 100 ml phosphate buffer pH 7.0 in separate volumetric flask. The content in each formulation was determined spectrophotometrically at 274 nm. Evaluation data were shown in Table 3.5

3.1.9 *In vitro* dissolution studies

In vitro dissolution studies for all the fabricated tablets, marketed formulation and pure drug was carried out using USP paddle method at 75 rpm in 900 ml of phosphate buffer pH 7.0 as dissolution media, maintained at 37° ± 0.5. Five ml aliquots were withdrawn at each specified time intervals filtered through whatmann filter paper and assayed spectorphotometrically at 274 nm. An equal volume of fresh medium, which was pre-warmed at 37^{o} was replaced into the dissolution media after each sampling to maintain the constant volume throughout the test. Dissolution studies were performed in triplicate. The various kinetic treatments were given to the dissolution data. The *in vitro* permeation data obtained were subjected to a zero order and first order kinetics. When a graph of the cumulative percentage of the drug released from the tablet against time is plotted, zero order release is linear in such a plot, indicates that the release rate is independent of concentration.[38-39]

Table 3.4: Characterizationof Granules

Formulation	Bulk density (g/cm^3)	Tapped density(g/cm^3	Hausner's ratio	Carr's index	Angle of repose	Flowability
A_1	0.425 ± 0.003	0.466 ± 0.001	1.10 ± 0.003	8.79 ± 0.30	24.85 ± 0.13	Excellent
A_2	0.428 ± 0.001	0.469 ± 0.001	1.09 ± 0.002	8.74 ± 0.24	25.35 ± 0.21	Excellent
A_3	0.447 ± 0.001	0.518 ± 0.001	1.16 ± 0.006	13.70 ± 0.60	26.80 ± 0.22	Good
A_4	0.468 ± 0.002	0.546 ± 0.002	1.16 ± 0.003	14.28 ± 0.42	27.76 ± 0.14	Good
A_5	0.416 ± 0.001	0.504 ± 0.003	1.21 ± 0.002	17.46 ± 0.52	30.50 ± 0.22	Good
A_6	0.383 ± 0.002	0.478 ± 0.003	1.24 ± 0.001	19. ± 0.19	33.13 ± 0.25	Passable
A_7	0.356 ± 0.003	0.431 ± 0.002	1.21 ± 0.004	17.40 ± 0.28	30.50 ± 0.23	Good
A_8	0.324 ± 0.002	0.393 ± 0.001	1.21 ± 0.002	17.56 ± 0.11	30.07 ± 0.10	Good
A_9	0.447 ± 0.001	0.492 ± 0.002	1.10 ± 0.001	9.15 ± 0.80	22.83 ± 0.28	Excellent
A_{10}	0.412 ± 0.003	0.449 ± 0.001	1.08 ± 0.001	8.24 ± 0.60	21.80 ± 0.21	Excellent
A_{11}	0.435 ± 0.001	0.500 ± 0.002	1.15 ± 0.000	13.00 ± 0.50	25.84 ± 0.15	Good
A_{12}	0.434 ± 0.001	0.497 ± 0.001	1.14 ± 0.001	12.68 ± 1.30	25.35 ± 0.23	Good
A_{13}	0.442 ± 0.003	0.546 ± 0.003	1.23 ± 0.003	19.05 ± 0.50	36.38 ± 0.20	Passable
A_{14}	0.451 ± 0.002	0.557 ± 0.002	1.23 ± 0.002	19.03 ± 0.30	35.60 ± 0.27	Passable
A_{15}	0.387 ± 0.002	0.473 ± 0.001	1.22 ± 0.003	18.18 ± 0.15	31.40 ± 0.21	Passable
A_{16}	0.361 ± 0.001	0.436 ± 0.001	1.20 ± 0.001	17.20 ± 0.18	30.52 ± 0.12	Good
A_{17}	0.494 ± 0.003	0.541 ± 0.001	1.09 ± 0.002	8.68 ± 0.10	25.35 ± 0.10	Excellent
A_{18}	0.478 ± 0.001	0.524 ± 0.002	1.09 ± 0.001	8.78 ± 0.30	24.85 ± 0.13	Excellent
A_{19}	0.392 ± 0.002	0.443 ± 0.003	1.13 ± 0.000	11.51 ± 0.55	24.35 ± 0.24	Excellent
A_{20}	0.431 ± 0.001	0.493 ± 0.002	1.14 ± 0.001	12.58 ± 0.54	26.32 ± 0.22	Good
A_{21}	0.488 ± 0.003	0.479 ± 0.003	1.23 ± 0.003	18.99 ± 0.24	35.60 ± 0.21	Passable
A_{22}	0.394 ± 0.001	0.482 ± 0.002	1.22 ± 0.002	18.26 ± 0.42	33.55 ± 0.15	Passable
A_{23}	0.370 ± 0.001	0.444 ± 0.001	1.20 ± 0.001	16.67 ± 0.26	30.96 ± 0.22	Good
A_{24}	0.374 ± 0.001	0.453 ± 0.003	1.21 ± 0.001	17.44 ± 0.21	30.51 ± 0.23	Good

Table 3.5Characterization of Tablets

Formulations	Uniformity of weight variation (mg)	Thickness (mm)	Hardness (kg/cm^2)	Friability (%)
A_1	249.1 ± 0.69	3.20 ± 0.12	3.0 ± 0.05	0.80 ± 0.06
A_2	250.1 ± 0.53	3.10 ± 0.15	2.50 ± 0.04	0.69 ± 0.02
A_3	249.0 ± 0.28	3.20 ± 0.19	3.1 ± 0.06	0.82 ± 0.06
A_4	248.7 ± 0.27	3.00 ± 0.06	2.50 ±0.02	0.71 ± 0.04
A_5	249.7 ± 0.34	3.25 ± 0.24	3.6 ± 0.03	0.85 ± 0.03
A_6	249.1 ± 0.39	3.15 ± 0.27	3.2 ± 0.04	0.73 ± 0.02
A_7	248.2 ± 0.12	3.20 ± 0.21	3.4 ± 0.07	0.84 ± 0.01
A_8	248.6 ± 0.34	3.10 ± 0.18	3.0 ± 0.05	0.72 ± 0.04
A_9	249.2 ±0.19	3.20 ± 0.34	3.9 ± 0.08	0.69 ± 0.06
A_{10}	250 ± 0.41	3.15 ± 0.29	3.7 ± 0.06	0.60 ± 0.09
A_{11}	248.6 ± 0.27	2.50 ± 0.25	4.1 ± 0.07	0.72 ± 0.08
A_{12}	251.2 ± 0.25	2.45 ± 0.43	4.0 ± 0.07	0.63 ± 0.03
A_{13}	252.2 ± 0.73	3.20 ± 0.36	4.7 ± 0.03	0.70 ± 0.01
A_{14}	249.3± 0.18	3.25 ± 0.32	4.5 ± 0.02	0.81 ± 0.04
A_{15}	247.2± 0.33	3.10 ± 0.36	4.5 ± 0.01	0.84 ± 0.02
A_{16}	248.4 ± 0.25	3.25 ± 0.28	4.2 ± 0.04	0.70 ± 0.05
A_{17}	248.6 ± 0.52	3.10 ± 0.38	5.0 ± 0.06	0.70 ± 0.03
A_{18}	249.4± 0.43	3.15 ± 0.54	4.50 ± 0.08	0.80 ± 0.02
A_{19}	250.1 ± 0.37	3.05 ± 0.51	5.251 ± 0.04	0.65 ± 0.01
A_{20}	249.6 ± 0.35	3.00 ± 0.46	5.00 ± 0.06	0.60 ± 0.06
A_{21}	249.7 ± 0.57	3.25 ± 0.39	5.8 ± 0.05	0.75 ± 0.04
A_{22}	251.2 ± 0.68	3.15 ± 0.42	5.6 ± 0.05	0.80 ± 0.06
A_{23}	250.0 ± 0.46	3.20 ± 0.52	5.5 ± 0.04	0.75 ± 0.04
A_{24}	250.2 ± 0.49	3.10 ± 0.35	5.3 ± 0.03	0.72 ± 0.07

<20 Excellent, 20-30 Very Good, 30-40 Good, 40-50 Poor, > 50 Very Poor

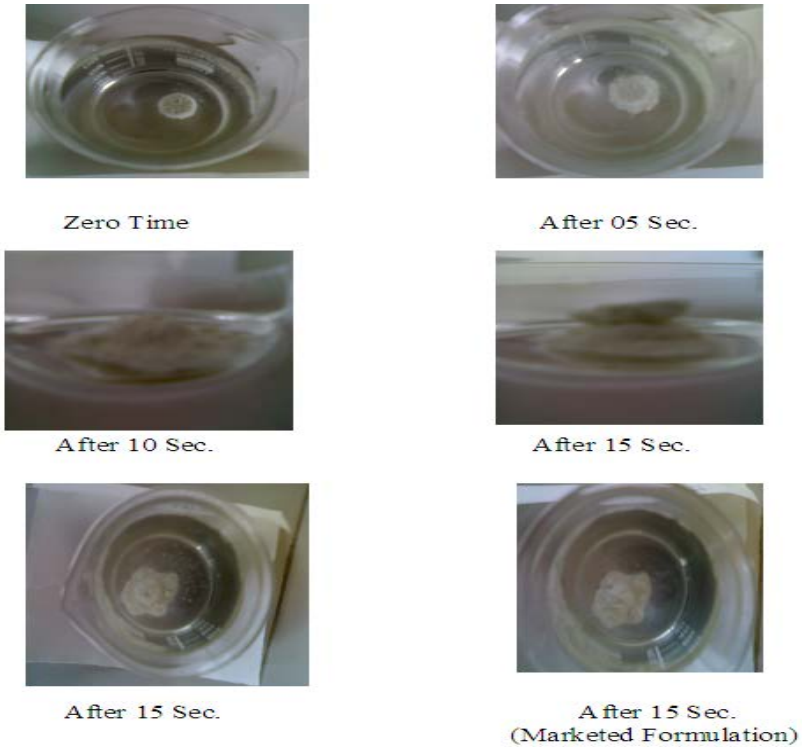

Fig.3.1: Different Stages of Disintegration Time of Formulated Aceclofenac Tablet Compared with Marketed Product

Table 3.6: Characterization of Tablets

Formulations	Wetting time (s)	Disintegration time (s)	Uniformity of drug content (mg)	% drug content
A_1	16.4 ± 0.20	20 ± 0.22	39.74 ±0.041	99.35 ± 0.40
A_2	13.2 ± 0.18	15 ± 0.23	41.16 ± 0.019	102.90 ± 0.44
A_3	19 ± 0.12	24 ± 0.18	39.66 ± 0.023	99.15 ± 0.60
A_4	18.3 ± 0.13	23 ± 0.26	40.34 ± 0.050	100.85 ± 0.51
A_5	20.4± 0.26	25 ± 0.24	38.64 ± 0.034	96.60 ± 0.58
A_6	17.8± 0.23	22 ± 0.33	38.84 ± 0.016	97.10 ± 0.57
A_7	28.4 ± 0.20	33 ± 0.30	39.12 ± 0.014	97.80 ± 0.53
A_8	22.3 ± 0.15	28 ± 0.58	39.53 ± 0.028	98.82 ± 0.44
A_9	19.4 ± 0.18	24 ± 0.67	39.04 ± 0.032	97.60 ± 0.68
A_{10}	16.3 ± 0.21	20 ± 0.40	40.56 ± 0.053	101.40 ± 0.49
A_{11}	25.8 ± 0.33	34 ± 0.17	38.78 ± 0.026	96.95 ± 0.84
A_{12}	23.3 ± 0.28	30 ± 0.28	39.60 ± 0.015	99 ± 0.41
A_{13}	33.4 ± 0.25	45± 0.26	38.42 ± 0.024	96.05 ± 0.86
A_{14}	21.03 ± 0.13	24 ± 0.34	38.70 ± 0.023	96.75 ± 0.49
A_{15}	50.2 ± 0.18	70 ± 0.15	38.56 ± 0.043	96.40 ± 0.53
A_{16}	30.8 ± 0.12	42 ± 0.22	38.84 ± 0.028	97.10 ± 0.55
A_{17}	22.4 ± 0.10	28 ± 0.27	38.98 ± 0.024	97.45 ± 0.43
A_{18}	19.4 ± 0.16	24 ± 0.34	39.86 ± 0.025	99.65 ± 0.61
A_{19}	32.6 ± 0.19	45 ± 0.54	38.42 ± 0.013	96.05 ± 0.69
A_{20}	28.3 ± 0.20	36 ± 0.42	39.32 ± 0.019	98.30 ± 0.80
A_{21}	46.4 ± 0.23	65 ± 0.49	38.36 ± 0.026	95.90 ± 0.43
A_{22}	32.5 ± 0.26	46 ± 0.34	38.64 ± 0.037	96.60 ± 0.47
A_{23}	84.0 ± 0.21	120 ± 0.26	38.42 ± 0.032	96.05 ± 0.68
A_{24}	43.2± 0.28	60 ± 0.21	38.78 ± 0.020	96.95 ± 0.56

Table 3.7: *In Vitro* Drug Release Data of Aceclofenac Tablet by using Direct Compression Method (Zero Order Release)

Time	Cumulative Percent Drug Released							
	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8
0	0	0	0	0	0	0	0	0
10	86.42	86.89	83.01	83.76	77.94	80.69	80.75	82.56
20	88.9	89.74	85.64	86.21	79.99	82.13	83.1	85.52
30	91.35	91.66	88.29	88.35	83.01	84.5	85.45	88.61
40	94.98	94.81	92.86	90.76	86.51	87.69	88.62	91.44
50	95.93	97.52	95.35	90.71	89.72	91.03	91.75	94.4
60	96.52	97.83	95.35	96.34	92.38	93.53	93.18	95.17
70	96.84	97.7	95.62	96.65	92.28	93.85	93.5	95.49
80	96.84	97.87	95.94	96.79	92.42	93.71	93.82	95.67
90	96.7	97.87	95.94	96.79	92.75	93.85	93.82	95.81
120	96.84	97.87	95.94	96.79	92.89	93.85	93.96	95.81

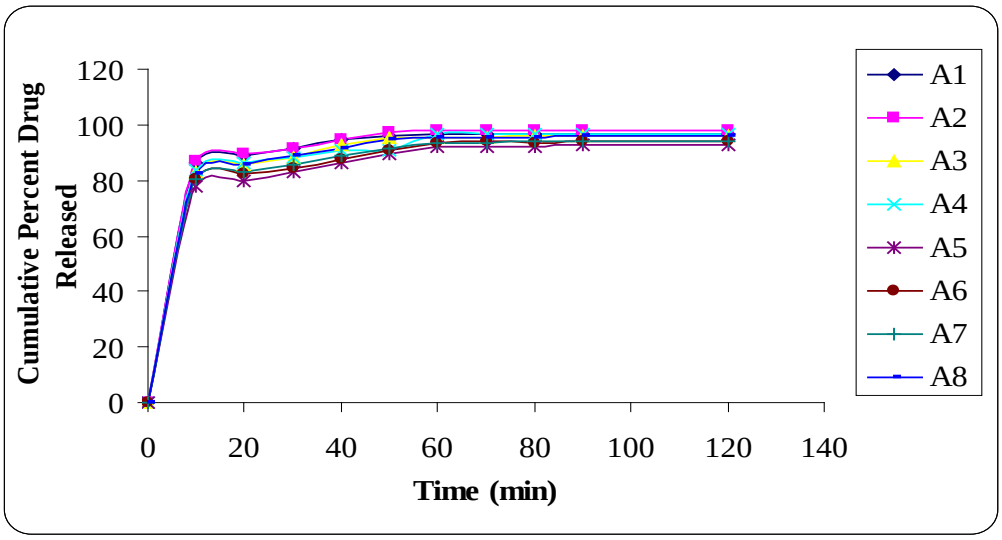

Fig.3.2: *In Vitro* Drug Release of Aceclofenac Tablet by using Direct Compression Method (Zero Order Release)

4. CONCLUSION:

Dispersive time of Aceclofenac can be increased by formulating it in a dispersible dosage form using optimum amount of Crospovidone, sodium starch glycolate, Avicel ph 102 and ispgula. The product tablet exhibited good dispersive time it was concluded that the dispersible tablets released drug in mouth in view to enhance bioavailability of Aceclofenac. Direct compression method was found to be more effectiveness in the preparation of dispersible tablet . Disintegration time and dissolution rate was found to be faster in direct compression as compared to wet / dry granulation . In case of natural disintegatants the formulation with Guar-Gum shows more release than the tablet with Ispagula , while in case of synthetic disintegrants the formulation with Crosspovidone shows more releases than the tablet Sodium Starch Glycolate.Direct compression method has a good pharmaco-economic advantage over the wet/dry granulation by reducing the production cycle time , man power required and ultimately enabling more productivity . The indirect benefits include the minimization of error contribution due to reduction in the number of processing steps, assuring quality compliance.For the *In-vitro* drug release profile it was evidence that the kinetics of drug release was first order for all the prepared dispersible tablets as the plot between log percent drug retained versus time showed good linearity. The good relationship was evidenced in the Hoxon-Crowell's cube root law which signifies the drug was assumed to dissolve out from the matrix or form the surface of devices. As the drug was released the

distance for diffusion becomes increasing greater. The dissolution profiles of all formulation have shown faster dissolution of Aceclofenac compared to conventional marketed tablet. The formulation prepared using Crosspovidone have shown faster disintegration and resulted in higher dissolution of Aceclofenac compared to another formulation .this implied that Crosspovidone can be used as a better disintegrant compared to other.

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