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RESEARCH ARTICLE

TO STUDY EFFECT OF POLYMER & ITS PROPORTIONS ON RELEASE PROFILE OF EROSION BASED TABLET

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ABSTRACT

In erosion controlled extended release systems that rate of drug release is controlled by the erosion of a matrix in which the drug release is controlled by the erosion of a Matrix in which the drug is dispersed. In this research article different examples are taken so as that to study effect of polymer & its ratio on release profile of matrix (erosion base) tablet. The erosion in its simplest form can be described as a continuous liberation of matrix material (both drug and excipients) from the surface of the tablet, i.e. surface erosion. The consequence will be a continuous reduction in tablet weight during the course of the release process.

Keywords: Erosion based Matrix tablet.

INTRODUCTION

An ideal drug delivery system should be able to deliver an adequate amount of drug for an extended period of time for its optimum therapeutic activity. Most drugs are inherently not long lasting in the body and require multiple daily dosing to achieve the desired blood concentration to produce therapeutic activity. To overcome such problems greater attention has been focused on sustained release drug delivery system.[1][2]

Nimesulide is BCS class-II drug. It was used as a model Drug.Nimesulide is a relatively COX-2 selective, non-steroidal anti-inflammatory drug (NSAID) with analgesic and antipyretic properties.In erosion controlled extended release systems t.hat rate of drug release is controlled.[3]

MATERIALS

Nimesulide (ACS Chemicals Ahmedabad, Gujarat, India), Eudragit, RLPO, Ethyl Cellulose & Talc(Chemdycorporation, Rajkot, Gujarat, India), Microcrystalline Cellulose (S D Fine Chemicals Limited Mumbai-30, Maharashtra, India), Magnesium Strearate(ASES Chemical works Jodhapur, Rajasthan, India)

METHOD

Preparation method of matrix Tablet: Matrix embedded sustained release tablets of Nimesulide were prepared by direct.Compression. Drug and all the excipients except magnesium stearate and talc were thoroughly blended in a mortar uniformly. Mixture was passed through mesh(No.40). After sufficient mixing of the drug with other components, finally magnesium stearate and talc were added and mixed for 2 minutes. Finally tablets were compressed by Rimex mini press-I using 10 mm concave punch.[4]

Table 1: Formula.

Ingredients	B1	B2	B3	B4
Nimesulide	100mg	100mg	100mg	100mg
Eudragit RLPO	25mg	-	25mg	-
Ethyl Cellulose(EC)	-	25mg	25mg	100mg
Microcrystalline Cellulose(CMC)	166mg	166mg	141mg	41mg
Talc	6mg	6mg	6mg	6mg
Magnesium Stearate	3mg	3mg	3mg	3mg
Total	300mg	300mg	300mg	300mg

EVALUATION OF MATRIX TABLET [5][6]:

Weight Variation: weight variation test is performed by weighing 20 tablets. Weight is measured by Electronic balance.

Table 2: Weight variation

Sr. No.	Weight of Tablet (mg)	Sr. No.	Weight of Tablet (mg)	Sr. No.	Weight of Tablet (mg)	Sr. No.	Weight of Tablet (mg)
1	294	6	303	11	307	16	309
2	288	7	292	12	301	17	299
3	287	8	285	13	309	18	278
4	291	9	296	14	310	19	289
5	302	10	305	15	311	20	296

Average Weight: 298mg

As per IP weight deviation is ±10% means range is 270mg to 330 mg. All 20 tablet within the limit, So comply weight variation test.

Diameter: 4.5cm

Thickness: 0.8cm

Diameter & thickness both are measured by means of varernear scale.

Hardness:Hardness is measured by means of Pfizer Hardness tester, It should be 4.5-5.5.

Friability:10 tablets taken weight initially then rotate in Roche type Friabilator at 25RPM for 4 minutes.The tablets are then weight & % friability was calculated as

% Friability=initial [(weigtht-Final weight)/Initial weight]x100

Initial weight=2956mg Final weight=2865mg

%Friability=(2956-2865/2956)100=3.08% not less than 1%, so not comply friability test.

Drug Content :The drug content of the tablets was measured spectrophotometrically. For this purpose 5 tablets were weighed and crushed in a pestle and mortar. % drug content or Assay of the tablet was determined by dissolving all tablet powder in 0.1N NaOH

Solution and measure absorbance in UV 1801 (Shimadzu) at 397 nm wavelength.

In Vitro Drug Release Study

In-vitro dissolution studies were carried out using USPtypeII (Paddle type) dissolution test apparatus (Electrolab TDT80L).The basket was rotated at 50 rpm and the temperature was kept at 37.5±0.5° C and 900 ml of dissolution medium was used.A single tablet was taken in 900 ml of dissolution media (7.4 Phosphate Buffer). The samples were withdrawn at intervals of 0.5,1,2,3,4,5,6, hrs and filtered through Whatman filter paper. Then test solutions were analyzed by UV Spectrophotometer by measuring absorbance at 397 nm. Drug concentrations in the sample were determined from standard calibration curve.

Table 3: In vitro dissolution profile of B1.

Time (hr)	Absorbance	Concentration					CPR (Cumulative Percentage Released)
		µ/ml	Before dilution (µ/ml)	µ/5ml	µ/900ml	mg/900ml	
0	0	0	0	0	0	0	0
0.5	0.177	5.366	5.366	26.83	4829.464	4.83	5.12
1	0.448	11.415	11.415	57.076	10273.661	10.27	10.9
2	0.540	13.469	13.469	67.344	12121.875	12.12	12.8
3	0.898	21.46	21.46	107.299	19313.839	19.31	20.5
4	0.204	5.969	5.969	179.063	32231.250	32.23	34.2
5	0.217	6.259	6.259	187.768	33798.214	33.8	35.8
6	0.312	8.379	8.379	251.384	45249.107	45.25	48

Table 4: In vitro dissolution profile of B2

Time (hr)	Absorbance	Concentration					CPR (Cumulative Percentage Released)
		µ/ml	Before dilution (µ/ml)	µ/5ml	µ/900ml	mg/900ml	
0	0	0	0	0	0	0	0
0.5	0.21	6.103	6.103	30.515	5492.7	5.5	5.957
1	0.643	15.768	15.768	78.84	14191.2	14.2	15.392
2	0.663	16.214	16.214	81.07	14592.6	14.6	15.827
3	0.882	21.103	21.103	105.515	18992.7	19	20.599
4	0.204	5.969	5.969	29.845	5372.1	5.37	34.958
5	0.222	6.371	6.371	31.855	5733.9	5.73	37.311
6	0.233	6.61	6.616	33.08	5954.4	5.95	38.749

Table 5: In vitro dissolution profile of B3

Time (hr)	Absorbance	Concentration					CPR (Cumulative Percentage Released)
		µ/ml	Before dilution (µ/ml)	µ/5ml	µ/900ml	mg/900ml	
0	0	0	0	0	0	0	0
0.5	0.037	2.241	2.241	11.205	2016.964	2.02	2.06
1	0.073	3.045	3.045	15.223	2740.179	2.74	2.8
2	0.105	3.759	3.759	18.795	3383.036	3.38	3.45
3	0.164	5.076	5.076	25.379	4568.304	4.57	4.66
4	0.234	6.638	6.638	33.192	5974.554	5.98	6.1
5	0.294	7.978	7.978	39.888	7179.911	7.18	7.33
6	0.322	8.603	8.603	43.013	7742.411	7.74	7.9

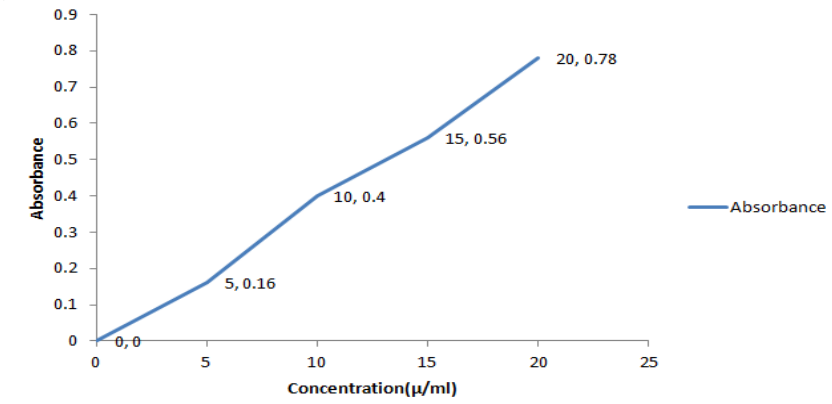

Figure 1: Standard Curve of Nimesulide in Phosphate Buffer 7.4

Drug release Mechanism

To know the mechanism of drug release from these formulations the data were treated according to zero-order (cumulative amount of drug release versus time), first-order (log cumulative percentage of drug remaining versus time), Higuchi (cumulative percentage of release versus square root of time) and Korsmeyer-Peppas(log cumulative percentage of drug released versus log time) equation models

Table 6: Comparision of kinetics of Various Models.

Batch	Models				
	ZERO	FIRST	Higuchi	Kosmeyer Pappas	Hixon Crowel
	Value of SSR				
B1	46.025	0.488	210.426	0.749	0.022
B2	75.661	0.003	101.222	0.895	0.027
B3	0.814	0.095	3448.19	0.173	0.0004

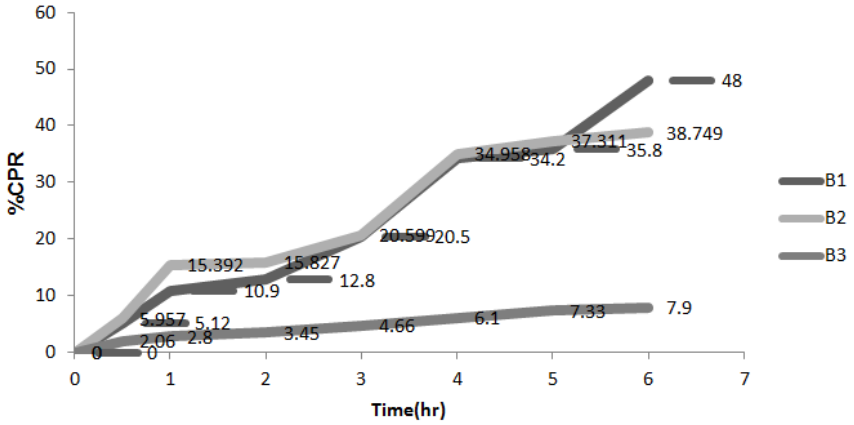

Figure 2: Comparision of Dissolution data of different Batches of B1, B2, and B3

RESULTS & DISCUSSION:

Table 7 :Physico- Chemical Properties of Matrix Tablet[7]:

Batches	Hardness(Kg/cm^2)	%Friability	Weight variation (mg)	Drug Content(%W/W)
B1	4.5	0.308	291.7±7.74	94.2
B2	4.9	0.218	281.9±8.65	96.3
B3	4.3	0.341	291.7±5.37	98.1
B4	5	3.08	298±8.5	94.5

DISCUSSION

Physico-chemical prosperities of compressed tablets

All the formulations were evaluated for weight variation, hardness, friability and % drug content.The weight variation of the all batches varied from 291.7±7.74, 281.9±8.65, 291.7±5.37mg. & 298±8.5. Hardness of the tablet varied from 4.3-5 (kg/cm^2) and drug content was found to be between 94.2-98.1%w/w. The friability for all formulations was found below 1%indicating good abrasion resistance charactors of tablets except B4 [8, 9].

In Vitro drug release study:The Drug Release study shows that after 6 hrs %drug release found to be 48%, 39% & 8% respectively for B1, B2, B3. It clearly indicates that as amount of polymer increases drug release at particular time decreases. Drug release kinetics for Formulation B1 (EudragitRLPO) shows that Hixon-Crowel model fits better than other kinetic models. Formulation B2 (EC) and B2 (Eudragit: EC: 1:1) follows first order kinetic and Hixon-Crowel model respectively [10]

CONCLUSION

Formulation B1 and B2 shows acceptable Physicochemical Properties and In Vitro drug release studies. Eudragit RLPO followsHixon-Crowel model and Ethylcellulose follows first order kinetics.

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