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FORMULATION AND EVALUATION OF COLON TARGETED DRUG DELIVERY SYSTEM OF FENOPROFEN USING HPMC K4M AND SODIUM ALGINATE AS POLYMERIC CARRIER

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ABSTRACT

The aim of the present work was to develop and evaluate colon specific sustained release tablet using Fenoprofen, Polymeric carrier (HPMC K4M & Sodium Alginate), coating material and matrix forming polymers. The colon targeted tablet was prepared by wet granulation technique using different percentage of Sodium Alginate as matrix carrier, starch mucilage as a binding agent, HPMC K4M as swellable polymer and coated with Eudragit polymers. Sodium Alginate, drug and physical mixture were evaluated for incompatibility study by Fourier transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC). All the batches of matrix tablet (F1-F9) were subjected for in-vitro dissolution in various simulated gastric fluids for suitability for colon specific drug delivery system. Tablets were evaluated for micromeritic properties of granules, physical properties, drug content, water uptake and erosion characteristics. F3, F6, F9 was optimized and subjected to coating based on evaluation results. The dissolution study of F9 revealed, release was 53.74% at the end of 6h and 99.68% after degradation at the end of 24h. The colon targeted matrix tablet of Fenoprofen showed no change either in physical appearance, drug content or dissolution pattern after performing stability study for 6 months. The studies confirmed that, the designed formulation could be used potentially for colon delivery by controlling drug release in stomach and the small intestine.

INTRODUCTION:

Oral ingestion has long been the most convenient and commonly employed route of drug delivery due to its ease of administration, high patient compliance, least sterility constraints and flexibility in the design of the dosage form. Hydrophilic polymers are becoming very popular in formulating oral controlled release tablets. As the dissolution medium or biological fluid penetrates the dosage form, the polymer material swells and drug molecules begin to move out of the system by diffusion at a rate determined by the nature and composition of the polymer as well as formulation technology (Sinha et al., 2002). The purpose of designing tablet dosage form is to develop a reliable formulation that has all the advantages of a single unit formulations and yet devoid of the danger of alteration in

Table 1. Formula for the formulations of Fenoprofen Matrix tablets containing HPMC K4M and Sodium Alginate in different concentrations

S.No	Ingredients	Quantity per Tablet in mg								
		F1	F 2	F3	F4	F5	F6	F7	F8	F9
1.	Fenoprofen	200	200	200	200	200	200	200	200	200
2.	HPMC K4M	100	150	200	-	-	-	50	75	100
3.	Sodium Alginate	-	-	-	100	150	200	50	75	100
4.	MCC	75	50	25	75	50	25	75	50	25
5.	Starch	75	50	25	75	50	25	75	50	25
6.	Talc	10	10	10	10	10	10	10	10	10
7.	Magnesium stearate	5	5	5	5	5	5	5	5	5
8.	Starch Paste	35	35	35	35	35	35	35	35	35

drug release profile and formulation behavior due to unit to unit variation (Chein et al., 2002), change in gastro luminal pH and enzyme population. Several polysaccharides like, pectin, chondroitin sulphate, amylase, guar gum, xanthan gum and chitosan are being investigated as carriers for colon specific drug delivery. In pharmaceutical formulations, pectin is used as a binder, disintegrant, suspending agent, thickening agent and stabilizing agent (Sarasija et al., 2000).

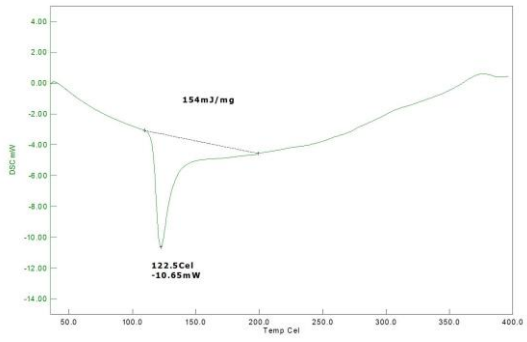

Figure 1. DSC Thermogram of Fenoprofen

HPMC K4M and Sodium alginate are reported to be potential carriers for colon specific drug delivery (Kshirsagar et al., 2000). Colon specific drug delivery systems are potential for not only for delivering various drugs to combat the local diseases for colon such as crohn's disease, ulcerative colitis, constipation and colon cancer but also for delivering some drugs for the systematic absorption for treating some diseases such as rheumatoid arthritis, nocturnal asthma, hypertension which possess circadian rhythms in their symptoms (Abrahamsson et al., 1996). There are several strategies being followed for targeting drugs specifically to the colon. Some of them are, pH dependent, time- controlled, prodrug-controlled, microbially triggered drug release (enzyme controlled), redox sensitive polymer approach and polysachharide as carrier. The pH approach has been shown to lack site-specificity because of inter/intra subject variation and the similarity of the pH between the small intestine and the colon Some of the natural polysaccharides which have already been studied for their potential as colon specific drug carrier systems are chitosan, pectin, chondroitin sulphate, cyclodextrin, dextrans, guar gum, insulin, amylase and bean gum.

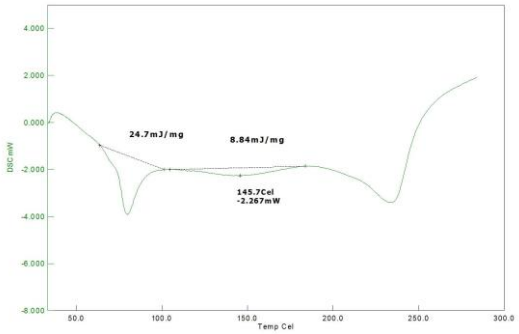

Figure 2. DSC Thermogram of HPMC K4M

Approaches being used for new anti-inflammatory drugs include the search for agents that inhibition of cyclooxygenase enzyme that is accountable for the alteration of arachidonic acid to prostaglandin G2 and to prostaglandin H2. Then it is diminish the prostaglandins responsible for inflammation, pain, swelling and fever. The rationale for the development of polysaccharide based delivery system for colon is the presence of large

amounts of polysaccharidases in the human colon as the colon us inhabited by a large number and variety of bacteria which secrete many enzymes e.g. D-glucosidase, D-galactosidase, amylase, pectinase, xylanase, D-sylosidase, dextranase,etc (Ghebre-Sellassie et al.,).

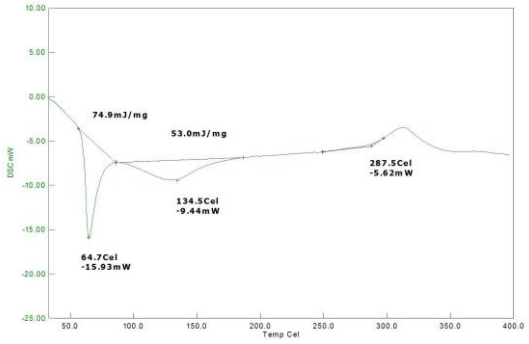

Figure 3. DSC Thermogram of Sodium alginate

Major approaches utilizing polysaccharides for colon specific delivery are fementable coating of the drug core, embedding of the drug in biodegradable matrix, formulation of drug saccharine conjugate (Vyas SP et al., 2007) . The potential of Sodium alginate as carriers for colonic drug delivery has been demonstrated previously (Hiorth et al., 2006). They are refractory to host gastric and intestinal enzymes, but are almost completely degraded by the colonic bacterial enzymes to produce a series of soluble oligogalacturonates. Depending on the plant source and preparation, they contain varying degrees of methyl ester substituent. Fenoprofen, nonsteroidal anti-inflammatory drug with analgesic and antipyretic properties is selected as a model drug. The aim of the present study was to prepare colon targeted tablets of Fenoprofen using HPMC K4M and Sodium Alginate as matrix polymer that offers protection to the drug until it leaves the stomach which is provided by pH dependent polymer (Singh et al., 2007). Eudragit S 100 and major drug release in small intestine is avoided by providing pH independent coating of Eudragit polymer (Momin et al., 2004). The objective of the present study was to develop a controlled release colon targeted drug delivery system of Fenoprofen for the treatment of Ulcerative Colitis.

MATERIALS AND METHOD

Materials: Fenoprofen was provided as a gift sample from Sanofi India Limited, Hyderabad. HPMC K4M, gift sample from Wockhardt Ltd, Chennai, Sodium Alginate, Sd fine chem. Ltd, Mumbai, Eudragit S 100, gift sample from Orchid Healthcare, Chennai. Microcrystalline cellulose (Avicel 102), Magnesium stearate, Talc and Starch were procured from commercial sources. All the other chemicals were of analytical grade. Double distilled water was used throughout the study.

METHOD

Preparation of Fenoprofen Matrix tablet

Step - I

Matrix tablet of Fenoprofen was prepared by the wet granulation technique using 10% w/v starch paste. The compositions of different matrix tablet formulation used in the study containing Fenoprofen are shown in Table 1. Compression was done using HPMC K4M and Sodium alginate as a carrier. HPMC K4M and Sodium alginate were included in the formulations in various proportions after sieving (sieve no 60) separately and mixed with Fenoprofen (sieve no. 100). The powders (F1-F9) were blended and granulated with 10% w/v starch paste. The obtained wet mass was pass through sieve number 16 (mesh size: 1000 µm) and the granules were dried at 50º C for2h. The dried granules were pass through sieve no. 25 (mesh size: 650 µm) and were lubricated with mixture of talk and magnesium stearate in definite proportion. The lubricated granules were compressed using 10 stations Cadmach Mini Rotary Tablet Press (Cadmach Machinary Co Pvt. Ltd) (Liu et al., 2003).

Step – II

The optimized formulation of tablet was coated using a combination of Eudragit S 100 by using a fluidized bed coating apparatus. The coating dispersion were passed through sieve 0.25mm aperture diameter and The spray rate was set to be 2ml/min at the compression air pressure was maintained at 12psi for better spray of polymer solution. The polymer solution was sprayed over the bed which was rotated at 20 rpm and controlled temperature (40 ± 2°C). Before coating the tablets were preheated to 40^0C for 15 min. The spray was

Table 2. Angle of Repose, Bulk density, Tapped density and compressibility Index for the formulations of Fenoprofen Matrix tablets containing HPMC K4M Sodium Alginate in different concentrations

S.NO	Formulations	Angle of Repose	Poured Bulk Density (gms/cc)	Tapped density (gms/cc)	Compressibility Index
1	F1	29.17°	0.498	0.589	15.45
2	F2	25.54°	0.496	0.548	14.63
3	F3	27.44°	0.462	0.586	14.92
4	F4	26.12°	0.427	0.502	12.42
5	F5	26.25°	0.478	0.526	13.42
6	F6	26.34°	0.458	0.561	14.48
7	F7	26.45°	0.486	0.578	13.46
8	F8	28.47°	0.482	0.567	15.72
9	F9	28.12°	0.476	0.564	14.64

Table 3. Thickness, Diameter, Hardness and Weight variation for the formulations

S.NO	Formulations	Thickness Mm	Diameter Cm	Hardness Kg/cm^2	Weight(mg) n=20
1	F1	2.1± 0.02	1.2 ± 0.02	4.8 ± 0.12	509±1.2
2	F2	2.2± 0.01	1.3± 0.11	4.6 ± 0.14	519±1.6
3	F3	2.1± 0.02	1.2± 0.03	4.7± 0.17	512±1.8
4	F4	2.1± 0.01	1.2 ± 0.01	4.2 ± 0.12	515±1.2
5	F5	2.3± 0.02	1.3 ± 0.09	4.2 ± 0.21	514±2.1
6	F6	2.1± 0.01	1.5 ± 0.13	4.2 ± 0.08	518±2.1
7	F7	2.1± 0.02	1.2± 0.03	4.7 ± 0.16	516±2.1
8	F8	2.2± 0.01	1.3 ± 0.10	4.8 ± 0.12	514±2.4
9	F9	2.1± 0.02	1.2 ± 0.02	4.8 ± 0.14	522±1.3

Table 4. Drug content, Friability and Swelling index for the formulations of Fenoprofen Matrix tablets containing HPMC K4M and Sodium Alginate in different concentrations

S.NO	Formulations	Drug content %	Friability %	Swelling index %
1	F1	98.98	0.62	110
2	F2	98.67	0.34	119
3	F3	101.27	0.28	105
4	F4	100.05	0.29	104
5	F5	99.76	0.46	107
6	F6	102.32	0.53	111
7	F7	99.81	0.34	109
8	F8	99.46	0.54	120
9	F9	102.07	0.32	131

continued until 10%w/w (weight gain was 100 mg/Tablet for Fenoprofen Matrix tablets of total weight gain. Coating solution was applied until there is no drug release in simulated gastric fluid. A 10% w/w increase in the coating level was selected as an optimum coating percentage level (Cheng et al., 2004).

Preformulation studies

Differential scanning calorimetry

The DSC curves of Fenoprofen, HPMC K4M, Sodium alginate and physical mixture of Fenoprofen were obtained using differential scanning calorimeter (Perkin Elmer, Japan) at increasing heating rate at 10˚ C/min and heated over a temperature range of 50˚ C to 250˚ C in an atmosphere of nitrogen

(20ml/min). Accurately twelve mg of sample was taken in a hermetically sealed, flat bottom aluminum sealed pan and placed at sample stage and thermograms were recorded.

Fourier transforms Infrared spectroscopy

FT-IR spectra of Fenoprofen, HPMC K4M, Sodium alginate and physical mixture of Fenoprofen were recorded at room temperature condition using KBr pellet technique. KBr pellets were prepared by applying a pressure of 5-7 tons. IR spectrum was recorded using Perkin Elmer Spectrum GX FT-IR, measured at the maximum at 4000 cm-1 using methanol as a blank.

Evaluation of granules

Determination of bulk density and tapped density

An accurately weighed quantity of the granules (W), was carefully poured into the graduated cylinder and the volume (V0) was measured. Then the graduated cylinder was closed with lid, set into the density determination apparatus. The density apparatus was set for 100 taps and after that, the volume (Vf) was measured and continued operation till the two consecutive readings were equal. The bulk density, and tapped density were calculated using the formulae (Ashutosh et al., 2008),

Bulk density = W/V0 Tapped density = W/Vf

Compressibility index

The compressibility index of the granules was determined by Carr's compressibility index.

Carr's index % = (V0 - Vf) / V0 × 100

Hausner's ratio

Hausner's ratio was measured by the ratio of tapped density to bulk density.

Hausner's ratio = Tapped density/ Bulk density

Angle of repose

Angle of repose was determined using funnel method. The height of the funnel was adjusted in such a way that the tip of funnel just touches the heap of the blends. Accurately weighed blends are allowed to pass through the funnel freely on to the surface. The height and diameter of the powder cone was measured and angle of repose was calculated using the following equation.

$\tan\theta = h / r$

Where, θ = Angle of repose, h = height of the pile, r = radius of plane surface occupy by the powder.

Evaluation of tablets

Thickness and hardness

Prepared matrix tablets were evaluated for thickness by using vernier calipers. Hardness of the tablets was evaluated using Monsanto hardness tester, which is expressed in kg/cm2 (Fukui et al., 2000).

Friability

Friability of tablets was determined using Roche friabilator. Twenty tablets were weighed and placed in a chamber. The friabilator was operated at 25 rpm for four minutes (per 100 revolutions) and the tablets were subjected and the tablets were subjected for combined effect of abrasion and shock because the plastic chamber carrying the tablets drops them at a distance of six inches with every revolution (Hausner et al., 1967). The tablets were then dusted and reweighed and the percentage of friability was calculated by using the following formula,

F = Wi - Wf / Wi × 100

Weight variation

Weight variation test was performed according to USP 2004, twenty tablets were taken and their weight was determined individually and collectively on a digital weighing balance. The percentage deviation was calculated and checked for weight variation (Carr and Hausner et al., 1995).

Drug content

Ten tablets of each formulation were weighed and powdered. The quantity of powder equivalent to 200 mg for Fenoprofen was transferred in to a 100 ml volumetric flask and extracted with 0.1N hydrochloric acid and kept aside for 2 hours. Then the solutions were filtered, suitable dilutions were made and absorbance was measured by using SHIMADZU UV- Visible spectrophotometer at 272 nm. Drug content was calculated.

Swelling index:

The swelling index of the tablets was performed, to comprehend the influence of swelling and erosion behavior of the formulation on its drug release, according to the procedure described below. The tablet was weighed accurately (W_0) and placed in a Petri dish of height 1.6 cm and diameter of about 9 cm containing 10 ml of distilled water at room temperature (27 ^{0}C±1) and the tablet was covered fully with water. At the end of 2 hours, the tablets were removed from the Petri dish and excess surface water was removed carefully using filter paper and swollen tablets were reweighed (W_t). The swelling index was calculated according to the formula;

$$\text{Swelling Index} = \frac{(W_t - W_0)}{W_0} \quad X \quad 100$$

Where,

W_t is the weight of Tablet at time't', W_0 is the weight of Tablet at time t = 0.

***In vitro* drug release studies**

The release studies of all the matrix tablets were performed using a USP type I dissolution test apparatus (paddle apparatus, 100 rpm, 37 ± 0.5ºC) in 900 mL of dissolution medium (SGF). 5 ml samples were withdrawn with pipetting syringe at appropriate time intervals and filtered through whatmann filter paper. Samples were estimated for drug using UV spectrophotometer (Simadzu, 1800) at suitable wave length 272 nm. Sink conditions were adjusted with the addition of an equal volume of fresh dissolution medium at the same temperature throughout the test. The pH of the dissolution medium was kept 1.2 for 2h then, pH of the dissolution medium was adjusted to 7.4 was kept for 3h, pH of the dissolution medium was adjusted to 6.8 and maintained up to 24h (Swarbrick et al., 2000).

Stability studies and storage condition

The selected formulation of tablets were stored in umber colored glass bottles at 45˚ C + 75% RH for a period of 3 months as per ICH tripartite guideline for stability testing of new drug substances and product framed by European agency for the evaluation of medicinal products and was observed for any changes in color, odour and percentage drug content and cumulative drug release in various simulated gastric fluids (SGF, SIF and SCF) (Kotwal et al., 2007).

Kinetic modelling of drug release profiles

The drug release kinetic data were subjected to zero order, first order, Higuchi model (Higuchi et al., 1963), Korsmeyer model and Peppas model for analyzing the mechanism of drug release and release kinetics from the dosage form using MS Excel 2007. The model with the highest correlation coefficient was considered to be the best fitting one (Dorozynski et al., 2004).

Zero-order release kinetics

Zero-order release kinetics, cumulative amount of drug released vs time and the release rate data are fitted to the following equation:

$C = K0 .t$

First–order release kinetics

First-order release kinetics, log cumulative percentage of drug remaining Vs time and the release rate data are fitted to the following equation:

$C = 100 \times (1 – e\text{-}Kt)$

Higuchi release model

The Higuchi release, cumulative percentage of drug released vs square root of time and the release rate data are fitted to the following equation: $Q = Kt1/2$ Where, K is the constant reflecting the design variables of the system and t is the time in hours. Hence, drug release rate is proportional to the reciprocal of the square root of time (Hixson et al., 1931).

Mechanism of drug release

To evaluate the mechanism of drug release from matrix tablet, data for the first 80% of drug release were plotted in Korsmeyer et al's equation, as log cumulative percentage of drug released vs. log time, and the exponent n was calculated through the slope of the straight line.

$Mt / M\infty = Ktn$

Where $Mt/M\infty$ is the fractional solute release, t is the release time, K is a kinetic constant characteristic of the drug/polymer system, and n is an exponent that characterizes

the mechanism of release of tracers (Korsmeyer et al., 1983). For matrix tablets, if the exponent n = 0.45, then the drug release mechanism is Fickian diffusion, and if 0.45 < n < 0.89, then it is non-Fickian or anomalous diffusion. An exponent value of 0.89 is indicative of Case-II Transport or typical zero-order release (Siepmann et al., 2001).

Statistical analysis

The cumulative percentage release of Fenoprofen from tablets in different medium was compared and the statistical significance was tested using student's t-test. A value of $p < 0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

DSC studies

DSC thermogram of Fenoprofen, HPMC K4M, Sodium alginate and mixture are depicted in (Figure 1, 2 and 3), respectively. The DSC thermogram of Fenoprofen, HPMC K4M, Sodium alginate and mixture showed identical peaks corresponding to pure drug indicated the absence of well defined chemical interaction between the drug and the polymers.

IR studies

Drug polymer interaction when studied by FT-IR, showed no drug: excipient interaction. which indicates that there is no chemical interaction between Fenoprofen, HPMC K4M and Sodium alginate which were used in the formulations.

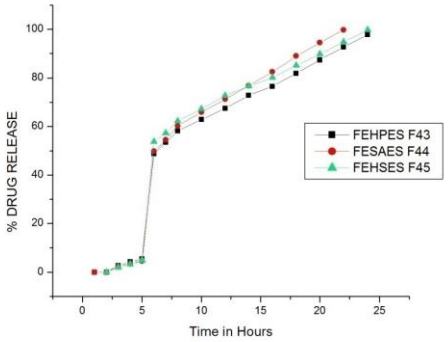

Figure 4. In vitro drug release for the formulations of Fenoprofen Spray coated Matrix tablets containing HPMC K4M and Sodium alginate in different concentrations

Micromeritic properties

The micromeritic properties of all the formulations were compared and it was found that F3, F6 and F9 were optimal and within specified limits. The micromeritic properties of various formulations are given in table 2. Different formulations of tablets were formulated using wet granulation and compression for which the granules were subjected to various micromeritic parameters. The optimum value of Carr's index (%) and Hausner's ratio should be upto 15% and 1.20 respectively (Aulton et al., 1988). Values for flow behavior less than or equal to 25 reveals free flowing characteristics of the material. All the formulation possessed good flow properties. Low value of angle of repose, Carr's index and Hausner's ratio (Table 2) revealed good micromeritic behavior of the granules. Since, the flow properties of the powder mixture are important for the uniformity of dose of the tablets; F9 was found to be the best among all the tablet formulations due to low Hausner's ratio, Carr's index and angle of repose.

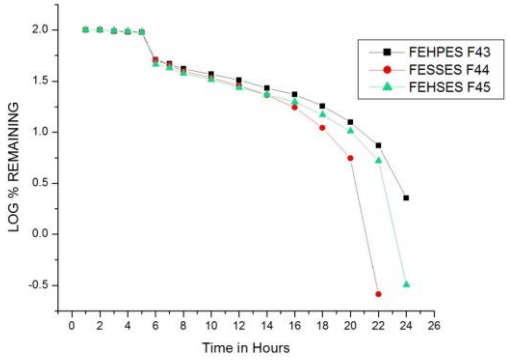

Figure 5. First Order Plots of drug release for the formulations Fenoprofen Spray coated Matrix tablets containing HPMC K4M and Sodium alginate in different concentrations

Physical properties

The hardness increased from 4.2 to 4.8 kg/cm2, which showed that hardness increased gradually with increasing Sodium alginate concentration. The tablets of different formulation showed varied thickness and hardness, 2.1 ± 0.01 to 2.3 ± 0.02 and 4.2 to 4.8, respectively. The friability and weight variation of different tablet formulations were found in compendial limits, i.e. 0.28 ± 0.03 to 0.62 ± 0.03 and 509 ± 1.2 to 522 ± 1.3 respectively. The drug content was found to be uniform in the different formulations (F1-F9).

Thus various concentrations of HPMC K4M and Sodium alginate did not influence the physical characteristics of the tablets, but swelling behavior and erosion are highly influenced by various concentration.

Percentage swelling and erosion of tablet

The swelling index (%) of all formulations ranged between104 and 131. All the matrix tablets formulated were found to be non-disintegrating in water, in 0.1N Hcl (pH 1.2), in phosphate buffer of pH 7.4 and in phosphate buffer of pH 6.8 fluids, without any erosion on the edges of the tablets. The percentage erosion was measured as the weight loss from matrix tablets immersed in dissolution media as a function of time.

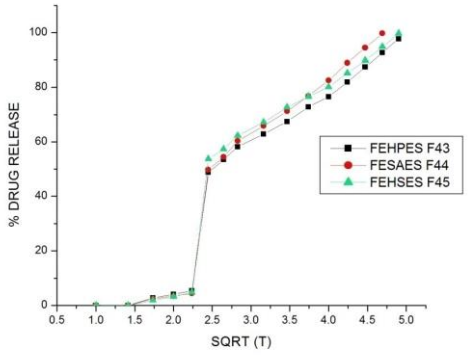

Figure 6. Higuchi Plots of drug release for the formulations of Fenoprofen compression coated Matrix tablets containing HPMC K4M and Sodium alginate in different concentrations

***In vitro* drug release studies**

Drug release Characteristics of Fenoprofen matrix tablets:

The dissolution profiles of tablets were determined by using 8-station dissolution apparatus (USP XXII apparatus, Electrolab) taking buffer solutions of 0.1N hydrochloric acid for the first 2 hours, phosphate buffer of pH 7.4 for the next 3 hours and phosphate buffer of pH 6.8 for the next period in the dissolution. The matrix formulations, F1 to F3 showed maximum drug release of about 18.35 % in the first two hours F7 to F9, showed maximum drug release of about 21.12 % in the first two hours, but F4 to F6, showed faster release and a maximum of 23.75% in acidic pH at 2 hours. The matrix formulations, F1 to F3 showed maximum drug release of about 41.70 % at pH 7.4, F7 to F9 showed maximum drug release of about 42.5% at pH 7.4 but F4 to F6 showed maximum of 43.64% in phosphate buffer of pH 7.4 at 5 hours. Formulation containing low concentration of HPMC K4M (30%) completely released the drug within 18hr at pH 6.8, and the formulation containing low concentration of sodium alginate (30%), completely released the drug within 16hr at pH 6.8.At mid concentrations of sodium alginate (40%) drug was completely released the drug within 20hr at pH 6.8 but at high concentrations of sodium alginate (50%), the drug release was extended up to 22 hours.

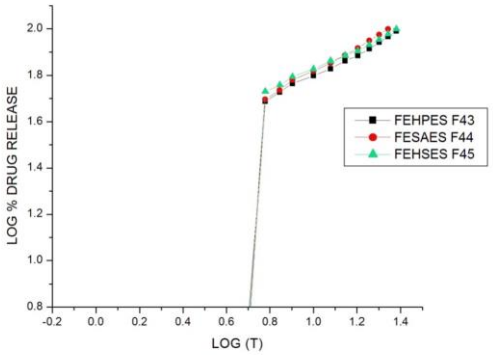

Figure 7. Peppas Plots of drug release for the formulations of Fenoprofen Spray coated Matrix tablets containing HPMC K4M and Sodium alginate in different concentrations

Formulation containing combination of Sodium alginate (30%) and HPMC K4M , completely released the drug within 18 hr at pH 6.8 . At mid concentrations of sodium alginate (40%) and HPMC K4M the drug was released in a controlled manner for the period of 24 hours but at high concentrations of sodium alginate (50%) and HPMC K4M the drug release was not complete within 24 hours. It extended after 24 hours.

In terms of drug release, fast and higher percent of drugs release was observed from formulations containing Sodium alginate than from formulations containing HPMC K4M, and HPMC K4M containing formulations showed the drug release in a controlled manner but not extended up to 24 hours. whereas the combination of HPMC K4M and Sodium alginate at mid concentrations the drug was released in a controlled manner for the period of 24 hours.

Step II

Based on physical properties, micromeritic properties, erosion and swelling behavior and in vitro drug release characteristics, F3 (FEHPES F43), F6 (FESAES F44) and F9 (FEHSES F45) were selected as optimized batch and was given pH dependent polymeric coating as described under the general methodology until to get a weight increase of 10 % w/w to the tablet weight and dried and subjected to in vitro dissolution studies.

***In vitro* release kinetics**

The mechanism of drug release from matrices containing swellable polymers is complex and not completely understood. Some systems may be classified as either purely diffusion or erosion controlled, while most system exhibit a combination of these mechanisms. In this study, drug release kinetics data were evaluated and the optimized for F3 (FEHPES F43), F6 (FESAES F44) and F9 (FEHSES F45) followed by zero order kinetics and diffusion as mechanism. Further the value of 'n' from Korsemeyer-Peppas equation indicates the release followed non–fickian diffusion which might be due to the combination of swelling and erosion of the tablets and diffusion of the drug to the dissolution fluid. The results are given in the table 3.

Stability studies

The result of accelerated stability studies, carried out according to ICH guidelines, indicated that there was no significant change in physical parameters (colors, friability and hardness) organoleptic characteristics and percentage drug content, during the study period. Study was performed at a raised temperature of 45ºC and 75 % RH for 6 month. The content was found above 97% at the end of 180 days. This indicated that F9 (FEHSES F45) tablet exhibited good physical stability and acceptable potency at accelerated storage condition for 6 months.

CONCLUSION

The prepared tablets met the compendia limits in terms of physiochemical parameters and dissolution studies. HPMC K4M and Sodium alginate as mucoadhesive polymer are best suitable in colon targeted drug delivery system to provide necessary drug release of Fenoprofen to be absorbed in colon and protect it from SGF and SIF. As a result, colon delivery of Fenoprofen appeared to be a promising alternative to traditional drug administration routes.

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