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Lansoprazole Release from a Floating Dosage Form based on the Natural Polymer of Delonix regia

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Abstract: The objective of this present investigation is related with exploitation of Delonix regia seed polysaccharide (DRSP) as an excipient and comparision of combination of natural and synthetic polymer for better sustained effect in floating drug delivery systems. This objective motivates for developing newer natural excipient and exploits the present limitation in terms of toxicity, compatibility and cost effectiveness. Present study aimed at development and characterization of sustained release matrix tablet of lansoprazole prepared by wet granulation method. The matrix tablets of lansoprazole were evaluated in terms of their precompression parameters, physical characteristics, in vitro release, buoyancy lag-time and total floating time. The results of the in vitro release studies showed that the optimized formulation F8 (natural polymer) could sustain drug release (98.74 %) for 24 hrs and remain buoyant for more than 24 hrs.. The drug release was decreased with the increase in DRSP concentration and with the addition of ethylcellulose. The drug release was observed by non-fickian diffusion mechanism. The release kinetics of the formulation F1and F2 (synthetic polymer) showed more release in 6hrs and 12hrs as compared to F7 and F8 (natural polymer). Drug release kinetics was explained by Higuchi's equation, as the plots showed the highest linearity, but a close relationship was also noted with zero-order kinetics. The optimized formulation was also subjected for stability testing and was found to have good stability with no appreciable drug degradation. Hence, it was found to be a better combination for the formulation of sustained release matrix tablets of lansoprazole

Key words: Lansoprazole, Delonix regia,Buoyancy, gastroretentive, sustained release.

Introduction

In recent years, oral dosage forms for gastric retention have drawn more and more attention for their theoretical advantages in permitting control over the time and site of drug release.[1] Floating drug delivery system is one of the approaches to increase the gastric residence time of the drug. The brief gastric emptying time in humans (2-3hrs through the major absorption zone - stomach or upper part of the intestine) can result in incomplete drug release from the drug delivery system leading to diminished efficacy of the administered dose. Thus, placement of the drug delivery system in a specific region of the gastrointestinal tract offers numerous advantages, especially to the drugs having narrow absorption window in the gastrointestinal tract, primary absorption in the stomach, stability problem in intestine, poor solubility at alkaline pH, local activity in stomach and property to degrade in

colon.[2] Several approaches are currently used to retain the dosage form in the stomach. These include bioadhesive systems, swelling and expanding systems, floating systems, and other delayed gastric emptying devices.The principle of buoyant preparation offers a simple and practical approach to achieve increased gastric residence time for the dosage form and sustained drug release.[3]

Polysaccharides are the choice of materials among the hydrophilic polymers used, because they are nontoxic and acceptable by the regulating authorities. The various natural Polysaccharides so far used in various drug delivery application are cellulose ethers, Gum karaya, Pullulan gum, Gellan gum, xanthan gum, locust bean gum, guar gum, *okra gum*, olibanum gum tamarind seed gum and Delonix regia seed [4]. *Delonix regia* used in treating gastric problems, body pain, and rheumatic pains of joints [5]

In the present study lansoprazole was selected as the payload model drug. Approximately 500000 new cases and 4 million recurrences of peptic ulcer are reported each year world wide. Lansoprazole is a proton pump inhibitor used as an antiulcer drug in the treatment and maintenance of healing of duodenal or gastric ulcers, erosive and reflux esophagitis, NSAID-induced ulcer, Zollinger-Ellison syndrome, and Barrett's esophagus. Lansoprozole is active against Helicobacter pylori with a bioavailability of 80% or more and protein binding of 97%. Its metabolism is mainly by liver and excretion by renal and fecal. It acts by irreversibly blocking the ATPase enzyme system of the gastric parietal cell [6]. Its half life is 1-1.5 hrs with poor absorption may be because of degradation and poor solubility. The solubility and absorption can be improved with an increase in the gastric residence time and also by creating basic pH due to the alkaline microenvironment with the release of sodium bicarbonate.

In the present investigation floating tablets of lansoprazole were prepared by effervescent approach using different polymers HPMC(K4M), ethyl cellulose and (DRSP) polymer in combination, are designed to prolong the gastric residence time, increase the drug bioavailability and patient compliance for taking once-a-day administration..

Materials and Methods:

Isolation of the gum from seeds of Delonix regia[7]

The pods of *Delonix regia*, family-Fabaceae were collected and these pods were imbibed in the water for an overnight to separate the seeds from the pods. The seeds mainly contain the three parts seed kernel, endosperm, and dicotyledon. The seeds (500 g) were boiled in the distilled water for 3 h until the seed kernels were swelled which was then removed by the hands. The gum part was separated from the yellow dicotyledons. The gum portion was dried in an oven at 45°C for 12 h and then was grounded in the multimill. The resulting powder was passed through 60 # sieve.

Solubility studies

Exactly weighed amounts of drug was repeatedly added to solubility bottles each containing fixed quantity of 0.1N HCl, 6.8 phosphate buffer, and distilled water until the solvent gets saturated. The suspension was agitated at 37 ± 0.5°C for 24 hrs. Aliquots were withdrawn from the suspensions and passed through millipore filter. The concentration of the drug in each solvent filtrate was analyzed using UV-Visible spectrophotometer (Perkin Elmer, Massachusetts, USA) at 280 nm The solubility study for each solvent was carried out in triplicate.[8]

Preparation of Lansoprazole floating tablet :

The composition of different formulations of lansoprazole floating tablets is shown in Table 1.

Each floating tablets containing 300mg lansoprazole were prepared by a conventional wet granulation method, employing sodium bicarbonate, citric acid as gas generating agent and water-soluble and insoluble polymer (HPMC K4M and Ethyl cellulose, DRSP) used in combination. The ingredients were weighed accurately and mixed thoroughly. Granulation was done with a solution of PVP K-30 in sufficient isopropyl alcohol. The granules (40 mesh) were dried in conventional hot air oven at 350C±0.50C. The dried granules mixed with magnesium stearate as lubricant, talc as glidant and compressed into tablet (8mm) on 10 station tablet punching machine (Cadmach, Ahmedabad). Prior to compression, granules were evaluated fortheir flow and compressibility characteristics.

Drug Polymer Compatibility studies

Fourier Transform Infra-Red Spectroscopy (FTIR)

The pure drug and physical mixture of drug and polymers were subjected to IR spectroscopic study using FT-IR spectrophotometer (IRAffinity-1, Shimadzu). The spectra were scanned over the wave number range from 4000 – 400 cm-1.

Differential Scanning Calorimetry (DSC)

DSC measurements were performed using Mettler Toledo Star 821e (Switzerland). The samples of pure drug ,and physical mixture of drug and polymers (5-10mg) were hermetically sealed in aluminum pans and heated at a constant rate of 20 °C/min over a temperature range of 25–200°C. An inert atmosphere was maintained by purging with nitrogen gas at a flow rate of 20 ml/min.

Evaluation of blend:

Angle of Repose

Angel of Repose of granules was determined by the funnel method. Accurately weighed powder blend were taken in the funnel. Height of the funnel was adjusted in such a way the tip of the funnel just touched the apex of the powder blend. Powder blend was allowed to flow through the funnel freely on to the surface. Diameter of the powder cone was measured and angle of repose was calculated using the following equation. [9]

$\tan \alpha = h/r$

Density

a) **Bulk density (BD):** Weigh accurately 25 g of granules, which was previously passed through 22# sieve and transferred in 100 ml graduated cylinder. Carefully level the powder without compacting, and read the unsettled apparent volume. Calculate the apparent bulk density in gm/ml by the following formula. [10]

Bulk density = Weigh of powder/ Bulk volume

b) **Tapped density (TD):** Weigh accurately 25 g of granules, which was previously passed through 22# sieve and transferred in 100 ml graduated cylinder of tap density tester which was operated for fixed number of taps until the powder bed volume has reached a minimum, thus was calculated by formula [10]

Tapped density = Weigh of powder /Tapped volume

Carr's Index

Compressibility index of the powder blend was determined by Carr's compressibility index. It is a simple test to evaluate the BD and TD of a powder and the rate at which its packed down. [11.] The formula for Carr's index is as below:

Carr's index= (Tapped density-Bulk density) /

Tapped density × 100

Hausner's Ratio

Hausner's Ratio is a number that is correlated to the flowability of a powder.[11]

Hausner's Ratio = Tapped density / Bulk density

Evaluation of Tablets:

Thickness:

Thickness of the tablets was determined using a vernier caliper (For-bro engineers, Mumbai, India).

Weight Variation Test

20 tablets of each formulation were weighed using an electronic balance and the average weight was calculated and compared with the weight of each tablet. The tolerance in weight variation was allowed according to IP 1996. [12]

Hardness

The tablets to be tested are held between a fixed and a moving jaw of hardness test apparatus

(Monsanto) and reading of the indicator is adjusted to zero. The screw knob was moved forward until the tablet breaks and the force required breaking the tablet was noted. [13]

Friability

Ten tablets were weighed and placed in the Roche fribilator test apparatus (Electrolab, Mumbai). The tablets were exposed to rolling and repeated shocks, resulting from free falls within the apparatus. After 100 revolutions, the tablets were reweighed. The friability was determined using

following formula. [14]

$$\% \text{ friability} = \frac{\text{weight of the tablet after test}}{\text{weight of the tablet before test}} \times 100$$

Drug Content Estimation

The drug content in each formulation was determined by triturating 20 tablets and powder equivalent to average weight was added in 100 ml of 0.1N hydrochloric acid, followed by stirring. The solution was filtered through a 0.45µ membrane filter, diluted suitably and the absorbance of resultant solution was measured spectrophotometrically at 280 nm using 0.1M hydrochloric acid as blank.[15]

***In Vitro* Buoyancy Studies**

The time taken for tablet to emerge on surface of medium is called the floating lag time (FLT) and

duration of time the dosage form to constantly remain on surface of medium is called the total floating time (TFT). The in vitro buoyancy was determined by floating lag time, per the method described by Rosa et al The tablets were placed in a 250-mL beaker containing 0.1N HCl. The time required for the tablet to rise to the surface and float was determined as floating lag time. [16]

Swelling Characteristics (Water Uptake Study)

The swelling properties were determined by placing the tablet in the dissolution test apparatus, in 900 ml of 0.1 N HCl at 0 37± 0.5° C. The tablets were removed periodically from dissolution medium. After draining free from water by blotting paper, these were measured for weight gain. Swelling characteristics were expressed in terms of percentage water uptake (WU %) show relationship between swelling index and time.[17]

WU %=
[Weight of swollen tablet –
Initial weight of the tablet]
---------- x 100
[Initial weight of the tablet]

In Vitro Dissolution Studies

The release rate of lansoprazole from floating tablets was determined using *United States* Pharmacopeia (USP) Dissolution Testing Apparatus 2 (paddle method). The dissolution test was performed using 900 ml of 0.1N hydrochloric acid, at 37 ± 0.5°C and 50 rpm. A sample (10 ml) of the solution was withdrawn from the dissolution apparatus hourly and the samples were replaced with fresh dissolution medium. The samples were filtered through a 0.45µ membrane filter and diluted to a suitable concentration with 0.1N hydrochloric acid. Absorbance of these solutions was measured at 280 nm using a UV/Visible spectrophotometer. The percentage drug release was plotted against time to determine the release profile.

***In Vitro* Drug Release Kinetic Studies**

Kinetic model had described drug dissolution from solid dosage form where the dissolved amount of drug is a function of test time. In order to study the exact mechanism of drug release from the tablets, drug release data was analyzed according to zero order[18], first order[19], Higuchi square root[20], Korsmeyer- Peppas model[21].The criteria for selecting the most appropriate

model was chosen on the basis of goodness of fit test. The data were processed for regression analysis using graph pad prism

Stability Study of Optimized Formulation (F8)

The optimized floating tablets (F8) were selected for stability study on the basis of *in vitro* buoyancy and *in vitro* drug dissolution studies. The tablets were investigated at 40°C/75% RH for 3 months. From the data, the formulation is found to be stable under the conditions mentioned before since there was no significant change in the percentage amount of drug content (Table 6). Thus, it was found that the floating tablets of lansoprazole (F8) were stable under these storage conditions for at least 3 months.

Table1: **Composition of different floating tablet formulation of Lansoprazole**

	Formulation Code (Quantities in percentage)							
Ingredients	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Lansoprazole	10	10	10	10	10	10	10	10
HPMC K4M	10	15	20	25	10	15	20	25
Ethyl cellulose	10	15	20	25	10	15	20	25
Delonix regia seed polymer	-	-	-	-	10	15	20	25
PVP K 30	4	4	4	4	4	4	4	4
Isoproyl alcohol	QS	QS	QS	QS	QS	QS	QS	QS
$NaHCO_3$	5	5	5	5	5	5	5	5
Citric Acid	1	1	1	1	1	1	1	1
Mg Stearate	2	2	2	2	2	2	2	2
Talc	1	1	1	1	1	1	1	1
Lactose	60	50	40	30	60	50	40	30
PVA	1	1	1	1	1	1	1	1

Table 2: Pre-Compression Evaluation of Lansoprazole Floating tablets

Formulation Code	Angle of Repose (^{o}) ±S.D	Bulk density* (g/cm^3) ±S.D	Tapped density* (g/cm^3) ±S.D	Carr's Index ±S.D
F1	23.71 ±S 0.51	0.486 ±0.011	0.562 ±0.041	13.58 ±0.72
F2	21.52 ±S 0.59	0.468 ±0.005	0.564 ±0.013	15.29± 0.56
F3	25.32 ±S 0.38	0.483 ±0.114	0.569 ±0.096	16.72 ±0.32
F4	26.42 ±S 0.72	0.446 ±0.032	0.567 ±0.038	17.60 ±0.27
F5	22.56 ±S 0.21	0.442 ±0.014	0.521 ±0.025	15.64 ±0.13
F6	24.75 ±S 0.34	0.453 ±0.147	0.534 ±0.12	17.26 ±0.24
F7	22.79 ±S 0.51	0.592 ±0.025	0.547 ±0.016	17.18 ±0.56
F8	25.29 ±S 0.12	0.614 ±0.071	0.549 ±0.052	19.16 ±0.92

Table 3 : Post Compression Evaluation of Lansoprazole Floating tablets

Formulation code	Thickness* (mm) ±S.D	Hardness* (Kg/cm^2) ±S.D	Friability* (%)±S.D	Weight variation (mg) ±S.D	Drug content (%) ±S.D
F1	4.1 ±0.01	4.5 ±0.03	0.82 ±0.04	0.298 ±0.511	95.34 ±0.005
F2	4.2 ±0.05	4.7 ±0.02	0.86 ±0.06	0.297 ±0.010	96.29 ±0.008
F3	4.29 ±0.0.03	4.2 ±0.02	0.69 ±0.02	0.299 ±0.024	97.36 ±0.021
F4	4.32 ±0.04	4.4 ±0.04	0.67 ±0.07	0.301 ±0.521	98.47 ±0.012
F5	4.53 ±0.05	5.0 ±0.01	0.71 ±0.01	0.296 ±0.0.011	96.85 ±0.014
F6	4.26 ±0.04	4.7 ±0.02	0.76 ±0.04	0.297 ±0.041	97.84 ±0.005
F7	4.32 ±0.01	4.9 ±0.04	0.85 ±0.02	0.300 ±0.001	98.64 ±0.006
F8	4.30 ±0.04	4.8 ±0.02	0.68 ±0.07	0.298 ±0.012	99.67 ±0.008

Table 4: Results of Invitro Buoyancy studies of Lansoprazole floating Tablets

Formulation code	Floating Lag Time (Seconds)	Total Floating Time (hours)	Swelling Index(%) (After 24 hrs)
F1	240.33± 1.52	6	55
F2	180 ±1.0	12	73.23
F3	60.66± 0.52	18	76.91
F4	80.21 ±2.08	20	81.46
F5	210.24 ±2.0	8	60
F6	105.10 ±0.57	16	77.24
F7	120.`12 ±0.64	22	82.79
F8	80.23 ±0.36	24	96.42

Table 5: Kinetics release data of different model for optimized formulation F8

Optimized Formulation code	% Cumulative drug release	Zero order R^2	First order R^2	Higuchi Kinetics R^2	Peppas Equation	
					R^2	n
F8	98.74	0.969	0.872	0.971	0.992	0.8013

Table 6: Stability study (40 C / 75% RH) of Optimized Formulation (F8)

Parameters	**1st Month**	**2 nd Month**	**3rd Month**
Physical apperance	Off white flat smooth faced	Off white flat smooth faced	Off white flat smooth faced
Weight Variation (mg)	0.298 ±0.012	0.298 ±0.012	0.298 ±0.012
Hardness (Kg/cm^2)	4.8 ±0.02	4.7 ±0.02	4.7± 0.02
Drug Content (%)	99.67 ±0.008	98.34 ± 0.23	97.76 ±0.006
Friability (%)	0.68 ±0.07		
Buoyancy Lag Time (s)	80.23 ±0.36	82.54± 0.45	84.34 ±0.12
Total floating time in hours	24	24	24
Buoyancy on disturbing	Float	Float	Float
In vitro release (%)	98.74 ±0.45	97.37 ± 0.89	96.23 ±0.74

Results and discussion

The pre-formulation studies were performed for the active pharmaceutical ingredient (API) to assess its formulation suitability. The solubility study data for the drug showed low solubility in acidic conditions (5.27µg/ml) than water (48.65 µg/ml) and phosphate buffer pH 6.8 (87.95 µg/ml).

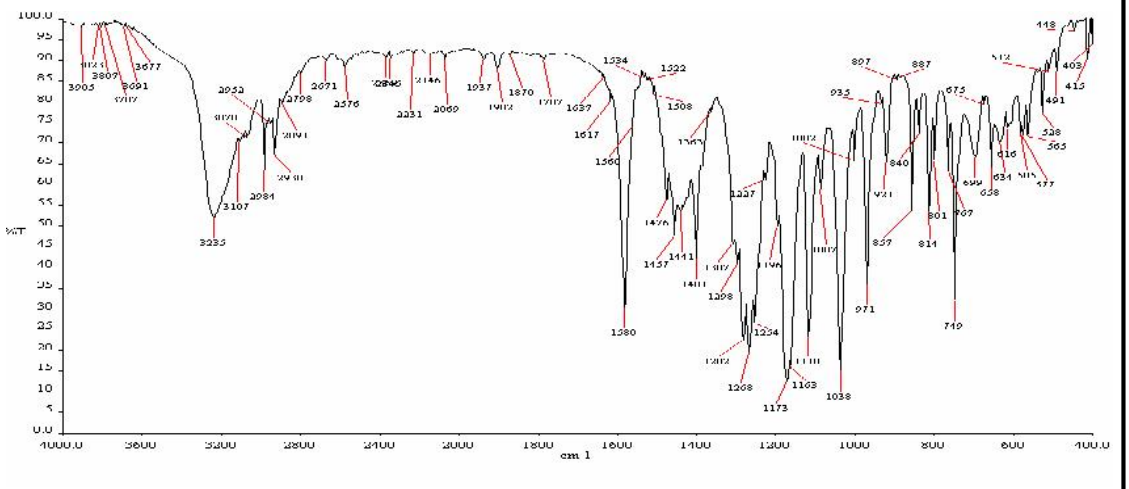
The effervescent floating tablets of lansoprazole were formulated to make a comparative evaluation of natural and synthetic polymer with HPMC K4M in two different batches (F1 to F4) by using combination of (HPMC K4M and Ethylcellulose), F5 to F8 (HPMC K4M and DRSP polymer) along with effervescing agent sodium bicarbonate and citric acid. It was found that Ethylcellulose has a negative effect on floating behavior for long duration but it showed drug release retardant characteristics. All the formulations were prepared by wet granulation method. The DRSP polymer exhibited excellent release retarding properties in matrix tablets for sustained release. Floating tablets of lansoprazole were designed in the present study to enhance its oral bioavailability and to achieve sustained release over 24 h for once-a-day administration.

Compatibility studies of lansoprazole:

FTIR Studies

Drug- excipient interactions play a vital role with respect to release of drug from the formulation amongst others. FTIR techniques have been used here to study the physical and chemical interaction between drug and excipients used. In the present study, it has been observed that there is no chemical interaction between lansoprazole and the polymers used. Form the figure1A it was observed that there were no changes in these main peaks in IR spectra of mixture of drug and polymers, which show there were no physical interactions. The characteristic absorption peaks of Lansoprazole appeared at 3235.54, 2984.23 & 2930.31, 1580.38, 1282.39, 1118.51 denoting stretching vibration of –NH-, -CH2, aromatic ring, C-O and ether bond, respectively. IR peaks observed in physical mixture of lansoprazole and Delonix regia seed polymer were -CH_2 (2984.23 & 2930.31),C=O (1580.24) C-O (1118.), -NH- (3237.5. IR peaks observed in physical mixture of lansoprazole, Delonix regia and HPMC K4M100 were CH_2 (2984.23 & 2930.31), C=O (1580.24), C-O (1118.2), NH (3339.32). There were no extra peaks were observed. Thus the chosen natural gums compatible with lansoprazole.

A.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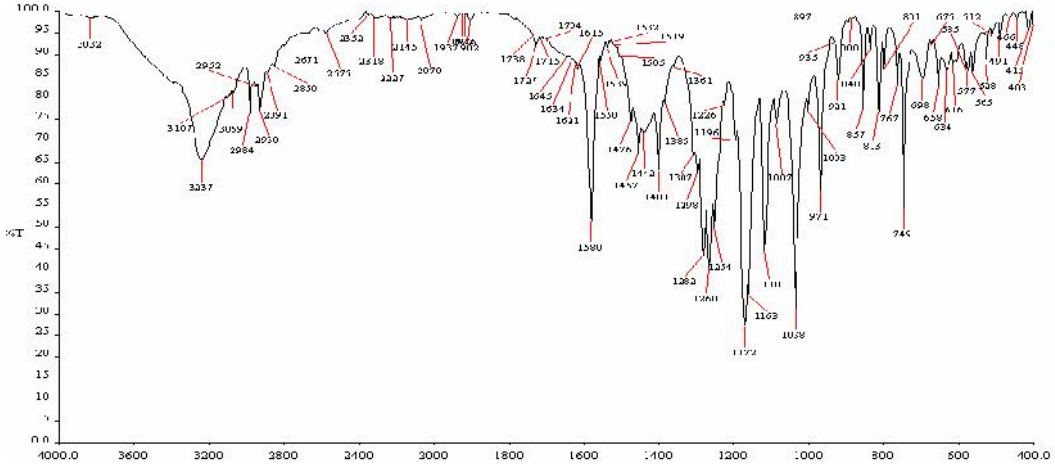
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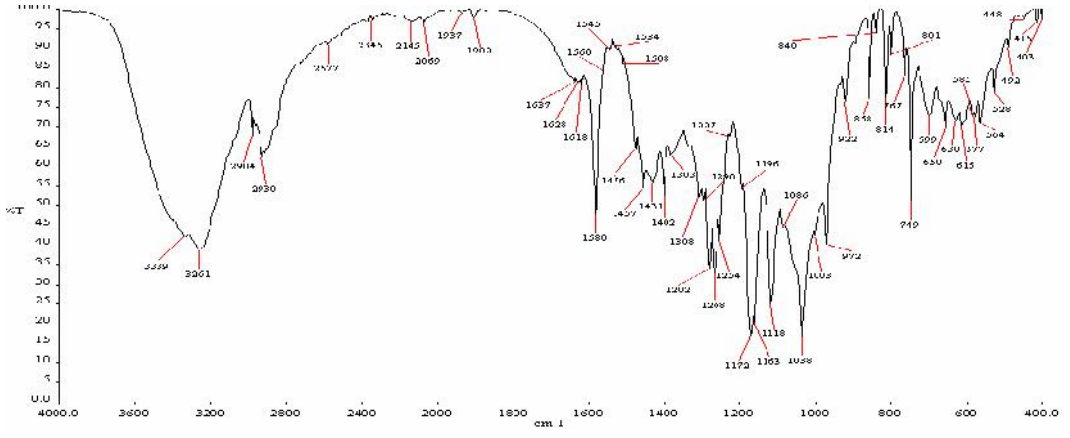
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FIGURE :- 1A FT-IR Spectrum of (A) lansoprazole, mixture of (B) lansoprazole and delonix regia seed powder and (C) physical mixture of lansoprasole, delonix regia seed powder and HPMC K4M 100

Differential Scanning Calorimetry (DSC)

Thermal behavior of pure Lansoprazole , delonix regia seed polymer and physical mixture of lansoprazole, DRSP and HPMCK4100M prepared are depicted in Fig. 1B. The pure LSP showed melting endothermic peak at 184.09 °C indicating crystalline nature of Lansoprazole, followed by exothermic peak which may be due to decomposition of Lansoprazole. The DSC thermogram of DRSP showed a endothermic peak at 87.37 °C indicating the glass transition temperature (Tg) of the polymer. The endothermic peak for the drug in physical mixture, showed minor changes in the melting endotherm of drug could be due to the mixing of drug and excipients , which lower the purity of each component in the mixture and may not necessarily indicates potential incompatibility.

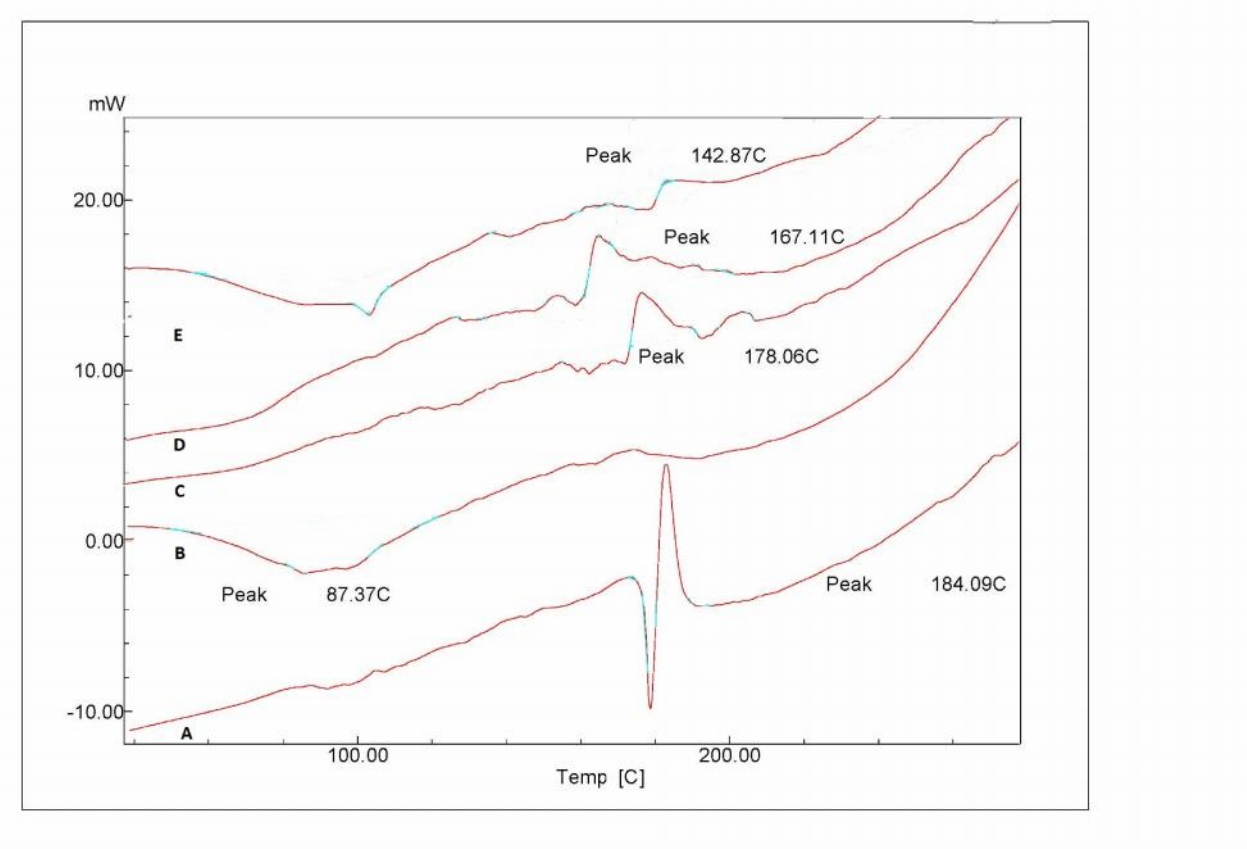


Fig 1B : DSC Thermal Analysis of (A) lansoprazole , (B) Delonix regia seed polymer, (C) Physicalmixture of Lansoprazole, Delonix regia and HPMC K4 100, (D)Physical mixture of Lansoprazole, Ethyl cellulose and HPMC K4 100, (E) Physica mixture of lansoprazole and Delonix regia seed polymer

Precompression Parameters of lansoprazole Granules

The formulations showed good flow property and compressibility index (Table 2). Angle of repose ranged from 21.52.01± 0.59 to 26.42± 0.72 and the compressibility index ranged from 13.58± 0.72 to 19.16 ±0.92. The LBD and TBD of the prepared granules ranged from 0.442 ± 0.014 to 0.614 ± 0.071 and 0.521 ± 0.025 to 0.569 ± 0.096 respectively. The results of angle of repose indicates good flow property of the granules and the value of compressibility index further showed support for the good flow property.

Post Compression Parameters of lansoprazole Floating Tablets

The shape of the tablets of all formulations remained off white, smooth, flat faced circular with no visible cracks. The thickness and diameter of tablets was measured by Vernier calipers and ranged between 4.10 ± 0.01 to 4.53 ± 0.05 mm, respectively. The hardness of the tablets was measured by Pfizer tester (Biological museum, Mumbai, India) and was in between 4.2 ± 0.02 to 5.0 ± 0.01 kg/cm2. The friability was measured by Friabilatror (Thermonic, Campbell Electronics, Mumbai) and was found to be

0.67 ± 0.07 to 0.8 6± 0.06%, which is an indication of satisfactory mechanical resistance of the tablets as shown in (Table3). The drug content estimations showed values in the range of 95.34 ± 0.005 to 99.6 7± 0.008% as shown in (Table 3) which reflects good uniformity in drug content among different formulations. All the formulations showed values within the prescribed limits for tests like hardness, friability and weight variation which indicate that the prepared tablets are of standard quality.

***In Vitro* Buoyancy Studies**

All the tablets were prepared by effervescent approach. Sodium bicarbonate was added as a gas-generating agent. Sodium bicarbonate induced carbon dioxide generation in presence of dissolution medium (0.1 M hydrochloric acid). The combination of sodium bicarbonate and citric acid provided desired floating ability and therefore this combination was selected for the formulation of the floating tablets. It was observed that the gas generated is trapped and protected within the gel, formed by hydration of polymer (HPMC), thus decreasing the density of the tablet below 1 and tablet becomes buoyant. The tablet swelled radially and axially during *in vitro* buoyancy studies. In this study, penetration of water into tablets prepared with synthetic polymer combination was rather slow, causing delayed gel formation and subsequent decrease in the floating lag time compared to the tablets prepared with natural polymer combination. (Table 4).

The floating tablets of lansoprazole with the synthetic polymer (EC) showed better floating lag time 60.66 second(F3), (80.21 sec.(F4) and it floated for 18hrs and 20hrs, and formulation with natural polymers (DRSP) showed more floating lag time (80.23 sec.(F8), 120.12 (F7)sec. but floated more than 24hrs and 22 hrs.

Swelling index:

The swelling index was calculated with respect to time. As time increase, the swelling index was increased, because weight gain by tablet was increased proportionally with rate of hydration.

Later on, it decreased gradually due to dissolution of outermost gelled layer of tablet into dissolution medium. The direct relationship was observed between swelling index and HPMC (K4M) concentration, ethyl cellulose and DRSP concentration increase, swelling index was increased

6.5 *In Vitro* Release Studies

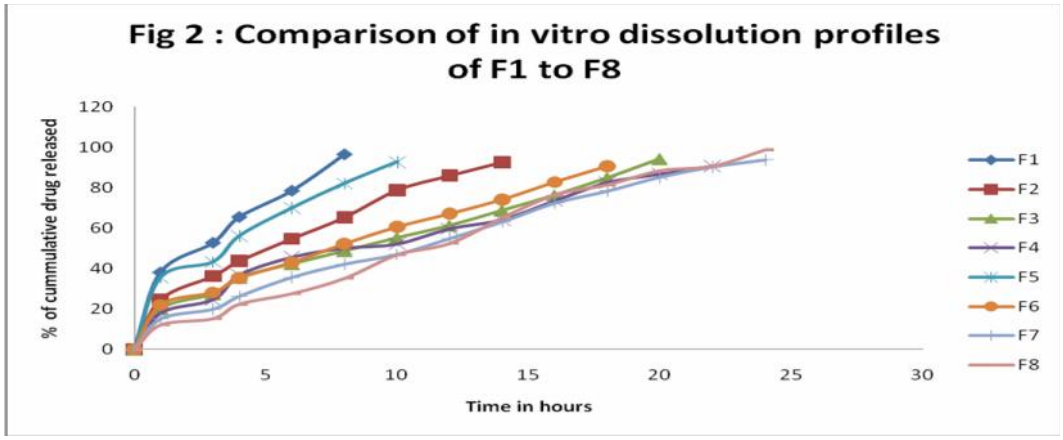
In vitro dissolution studies of all the formulations of floating tablets of lansoprazole were carried out in 0.1N HCl. The study was performed for 24hrs and cumulative drug release was calculated at every one hour time interval. It was observed that the type of natural polymer(DRSP) influences the drug release pattern. All the formulations contained equal amount of gas generating agent (sodium bi carbonate) and citric acid. All Batches were evaluated for the cumulative drug release. From the dissolution study of batch F1 to F8, it was concluded that release from the matrix is largely dependent on the polymer swelling, drug diffusion and matrix erosion. From *in vitro* dissolution profile, the batches (F1 to F4) prepared with different concentration of polymers (HPMC K4 and EC), formulation F1 showed 96.35±1.12 cumulative % drug release and floated for 6hrs, F2 showed 92.47±1.11 cumulative % drug release at 12 hrs. and formulation F3 showed 94.26.13±1.02 cumulative % drug release at 18 hrs, F4 showed 90.56.±1.32 cumulative% drug release at 20 hrs, . Increase in concentration of HPMC may result in increase in the tortuosity or gel strength of the polymer. From in–vitro dissolution profile of batches (F5 to F8) prepared with different concentration of (HPMC K4 and DRSP) showed a stronger retardation of drug release compared to synthetic polymers. The drug release from formulation F5 showed 92.75±1.44 cumulative % drug release at 8 hrs. and formulation F6 showed 90..72±1.62 cumulative % drug release at 16 hrs, formulation F7 showed 93..76±1.62 cumulative % drug release at 2 hrs, formulation F8 showed 98..74±1.62 cumulative % drug release and sustained for more than 24 hrs, a significantly higher rate and extent of drug release was observed from the batches based on synthetic polymers. Varying the amount of natural polymer affect the drug release. Drug release from natural polymer was less owing to its high viscosity and also due to less permeability of water to DRSP. More over synthetic polymers containing tablets F1-F4 could not bear their matrix shape until 12 h and the released the drug before 12 hrs. Tablets F5-F8 containing natural polymer (DRSP) in the increasing concentration, F8 was found to sustain drug release more than 24 hrs shown in fig.2.

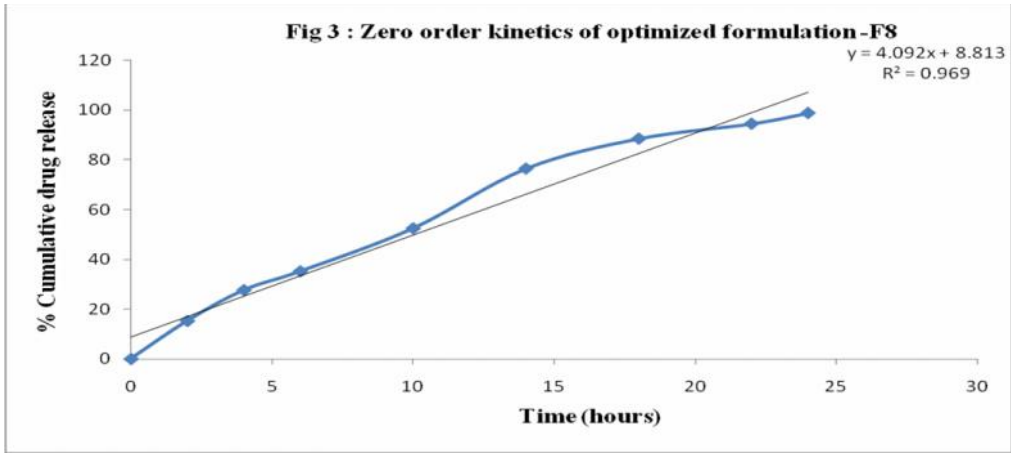
It was observed that the drug release was slower from formulations containing natural polymer as compared to synthetic polymers. This may be due to hydrophobic nature of natural polymer, which restrict the penetration of medium inside the matrix and also restrict the formation of gel layer around

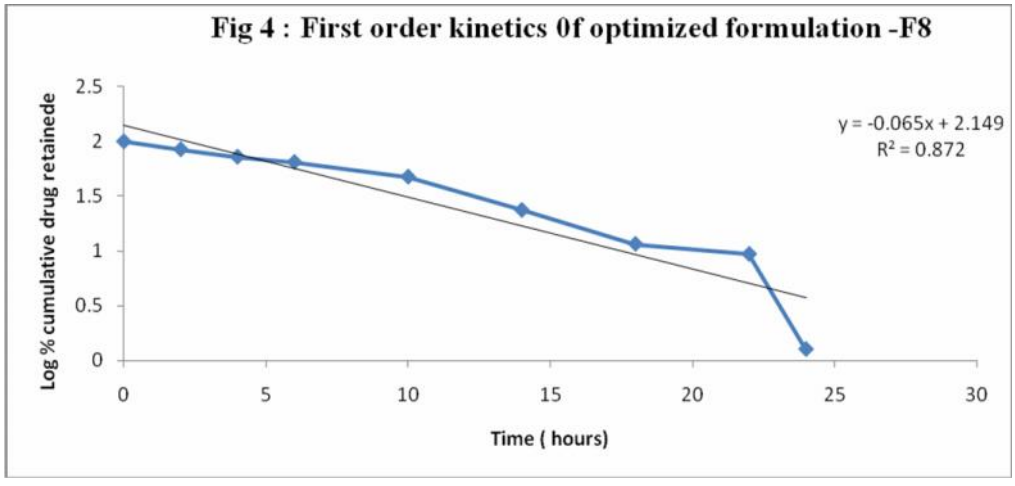
the matrix as compared to the hydrophilic HPMC. When the polymer concentration was increased, the drug release rate was found to decrease. This is due to the reason that the swelling degree is less because of higher concentration of polymers.

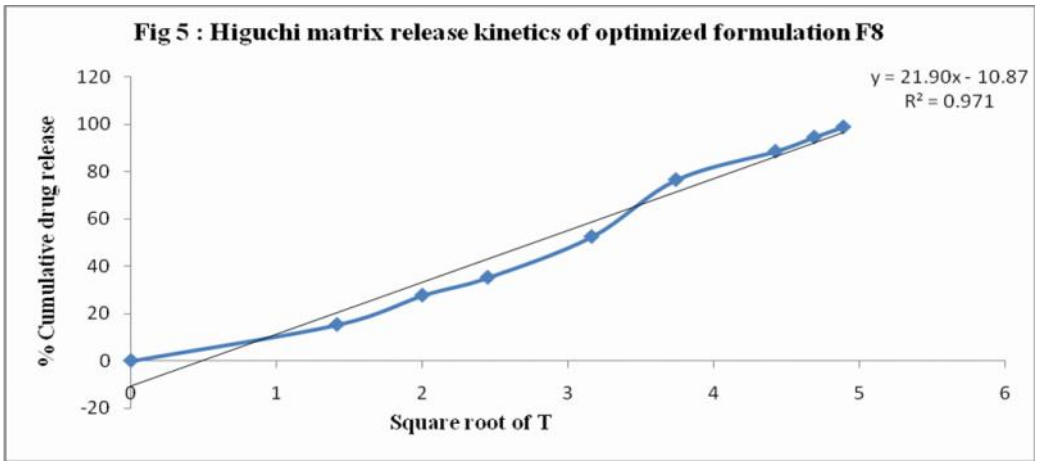
Among all the formulations formulation F8 showed a constant rate of drug release in a sustained manner similar to zero order kinetics with good buoyancy property. (Fig 3,4.5&6 and Table 5). Hence F8 was chosen as the best formulation.

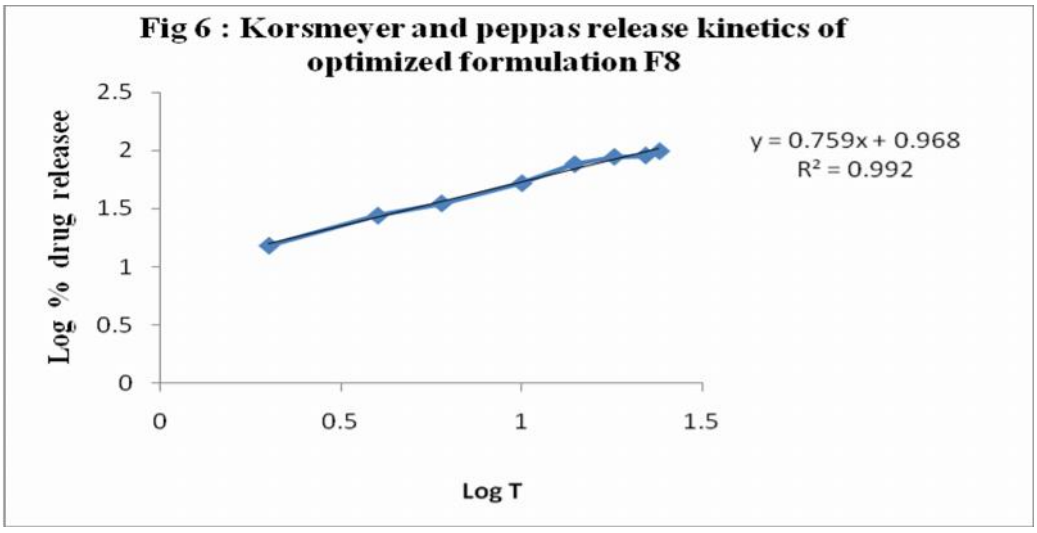
Stability studies of optimized formulation were performed at normal, intermediate and accelerated conditions. The data are shown in Table 6. It was found that formulation placed at 25ºC show very less amount of drug loss, which indicates that formulation is more stable at room temperature.











Conclusion :

This study discusses the preparation of gastroretentive tablets of Lansoprazole.. The addition of gel-forming polymer HPMC K4M, natural polymer and gas-generating agent sodium bicarbonate was essential to achieve *in vitro* buoyancy. The invitro release of the formulation F1and F2 showed more drug release as compared toF7 and F8 (natural polymer) shows better sustained release properties than synthetic polymer. From the results of the sustained release properties, it can be concluded that the natural novel polymeric material from *Delonix regia* may be natural and economical alternative for the formulation of floating drug delivery system.

Since *Delonix regia* gum is of natural origin it is non-toxic, biocompatable and cheaper.. Now a day's person prefers plant based medicines over synthetic medication for the treatment of different disease because of their safety as well as economy. However, extensive in vitro and in vivo study needs to be performed to support the hypothesis.

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