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A NOVEL SOLUBILITY ENHANCEMENT METHOD OF LANSOPRAZOLE BY MIXED HYDROTROPY FOR THE FORMULATION AND EVALUATION OF FAST DISSOLVING TABLETS OF LANSOPRAZOLE

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ABSTRACT
Low aqueous solubility is a major problem faced during formulation development of new drug molecules. Lansoprazole (LPZ) is an anti ulcer agent and is a good example of the problems associated with low aqueous solubility. Lansoprazole is practically insoluble in water. Hence, purpose of this research was to enhance the solubility of LPZ by using the concept of mixed hydrotropy. Initially, solubility of LPZ was determined individually in urea sodium acetate, and sodium benzoate at concentration of 10% w/v solutions using purified water as a solvent. Highest solubility was obtained in 10% urea solution. In order to decrease the individual Hydrotrope concentration mixed hydrotropic agents were used. Highest solubility was checked with combination of these hydrotropic agents. The optimized combination was utilized in the preparation of solid dispersions by using distilled water as a solvent. Formulation of Immediate release tablets of Lansoprazole (LPZ) using mixed hydrotrophy technique with different concentrations of super disintegrants such as Crosspovidone, Croscarmellose sodium and sodium starch Glycolate were prepared by using direct compression method. Dissolution studies of prepared tablets were done using USP Type II apparatus. The batch CF3 tablets show 99.0% cumulative drug release within 40 min. There is miraculous enhancement in solubility and bioavailability, hence it was concluded that the concept of mixed hydrotropic solid dispersion is novel, safe and cost-effective technique for enhancing the bioavailability of poorly water-soluble drugs.

KEYWORDS: Lansoprazole, Mixed hydrotropy, Solid dispersions.

INTRODUCTION
Solubility enhancement of poorly aqueous soluble drugs of BCS class II and IV is an important aspect of pharmaceutical research. Solubility associated issues have been elucidated by different technological approaches like solvent dispersion, physical mixture, solid dispersion, hypotrophy, freeze drying during the pharmaceutical product development.[1,2] Oral drug delivery is the most desirable and preferred method of administering therapeutic agents for their systemic effects. Solid dosage forms like tablets, capsules are the most popular form among all the other dosage forms and liquids, existing today because of its convenience of compactness, easy manufacturing and self administration. It is difficult to swallow tablets as well as hard gelatin capsules and also when water is not available in the case of motion sickness, allergic attacks of coughing during the common cold and bronchitis. For these reasons tablets which rapidly dissolve or disintegrate in the oral cavity play an important role and are called fast dissolving tablets. These fast dispersible/dissolving tablets disintegrate instantaneously when put on tongue, releasing the drug, which dissolve or disperses within 60 seconds in the saliva in the absence of water.[2]

Mechanism of disintegration by the superdisintegrants
- Swelling occurs upon contact with water and thus adhesiveness of other ingredients of the tablet is lost, causing the tablet to fall apart.
- Due to the porous nature of the tablet, the liquid is drawn (wicking action) into the pathways through capillary action, thus the inter-particulate bonds get ruptured causing the tablet to fall apart.[3]
- The tablet gets disintegrated when superdisintegrants with exothermic properties get wet, thus generation of localized stress occurs due to capillary air expansion.
- Generation of pressure within the tablet occurs as carbon dioxide is released upon wetting of the tablet due to the interaction of bicarbonate and carbonate with citric or tartaric acid causing the tablet to disintegrate.

- The superdisintegrants get deformed during tablet compression and upon contact with water they regain their normal structure which causes an increase in the size of deformed particles resulting in the breaking of the tablet.[4]

Lansoprazole is a proton pump inhibitor (PPI) which inactivates the final step in the gastric acid secretion pathway in gastric parietal cells in a dose-dependent manner. Bioavailability is 85% after the first dose – the highest among PPIs resulting in rapid relief of symptoms. Lansoprazole also exhibits antibacterial activity against Helicobacter pylori in vitro.[4] Seventeen years of clinical experience worldwide have shown lansoprazole to be an effective and well-tolerated treatment option in the management of acid-related disorders, including gastric and duodenal ulcers and gastroesophageal reflux disease, and the treatment or prevention of gastroduodenal lesions induced by NSAIDs.[5,6] Lansoprazole comes under the BCS II classification drug which has poor aqueous solubility & bioavailability.[7]

MATERIALS AND METHODS

Lansoprazole was obtained from Triveni chemicals, Gujarat. Urea, Sodium acetate, Sodium borate, Sodium citrate, Povidone, Crosscarmellose sodium, Sodium starch Glycolate Microcrystalline cellulose and all exciepients obtained from Finar chemicals ltd, Ahmedabad.

Drug-Polymer Interaction Study: From the spectrum of Lansoprazole, physical mixture of Lansoprazole and polymers observed that all characteristic peaks of Lansoprazole were present in the combination spectrum, thus indicating compatibility Lansoprazole.

Equilibrium solubility studies in different hydrotropic agents: 10% w/v, solutions of each hydrotropic agent viz., urea (U), sodium benzoate (B), and sodium acetate (A) were prepared in water. For determination of solubility accurately measured 5 ml of above particular solution of hydrotropic agent was taken in a 10 ml vial and excess amount of drug (LPZ) was added and mechanically shaken until saturated solution was formed. Each vial was shaken on the mechanical shaker for 12 h and hence that equilibrium solubility can be achieved, and the solution was allowed to equilibrate for 24 h. The solution was further centrifuged at 2000 rpm. for 10 min in ultra-centrifuge and further filtered through Grade 41 Whattmann filter paper. Aliquot was suitably diluted with distilled water and analyzed using UV spectrophotometer at 247 nm. Enhancement ratios in solubility were calculated by the following formula.[9,10]

Solubility enhancement ratio=Solubility of hydrotropic agents/Solubility of drug in water

Table 1: Equilibrium Solubility of Lansoprazole In Different Hydrotropic Agents.

S No	Code of Hydrotrope	Hydrotropic agent	Concentration (%w/v)	Solubility enhancement (%)
1	H1.	Urea (U)	10	40
2	H2	Sodium Acetate (A)	10	54
3	H3	Sodium Benzoate (B)	10	65
4	H4	Sodium Citrate (C)	10	34
5	LH.1	U+A (1:1)	10	42.7
6	LH.2	U+A (1:2)	10	48.2
7	LH.3	U+B (1:1)	10	56.2
8	LH.4	U+B (1:2)	10	60.5
9	LH.5	A+B (1:1)	10	82.3
10	LH.6	A+B (1:2)	10	95.2

Equilibrium solubility studies in mixed hydrotropic blends: Initially 2-3 hydrotropic agents were mixed in 1:1 ratio and dissolved in water to get clear solution, excess amount of drug (LPZ) was added in above solution and mechanically shaken until saturated solution was formed and solubility in water was determined as shown in Table 1.

Formulation of hydrotropic solid dispersions of Lansoprazole: For preparation of hydrotropic solid dispersion, accurately weighed 0.75g sodium benzoate, 0.25 g of sodium acetate (so that total weight of the mixture was 1g) were taken in a 100 ml beaker and properly mixed. Further, minimum quantity of warm distilled water sufficient to dissolve the above hydrotropic blend was added, If minimum amount of water (approximately 5 ml) is used lesser will be the time required to evaporate it and chemical stability of drug may not be affected adversely during removal of the water.[11]

Dissolution of the hydrotropic mixture was facilitated by agitation of a teflon coated magnetic rice bead on a high-speed magnetic stirrer. After complete dissolution of above hydrotropic mixture, 1 g of LPZ (drug to carrier ratio was 1:1) was dissolved in the above solution and temperature was maintained in the range of 55-60°C so as to facilitate the water evaporation. As soon as evaporation of water increases speed of rice magnetic bead automatically decreased due to increased viscosity and it stopped stirring when most of the water was evaporated, this indicates the formation of hydrotropic solid dispersion (wet). The wet solid dispersion thus obtained were spread on several watch glasses and the

watch glasses were kept in hot air dry oven maintained at 50°C ± 2°C so that remaining moisture could also be evaporated easily and a constant weight with no further weight loss (due to evaporation) could be obtained.[12] After complete drying, hydrotropic solid dispersions were crushed using a glass pestle mortar and passed through sieve no. 60 and were finally stored in an air tight glass bottle.[15]

Formulation Lansoprazole immediate release tablet

The Lansoprazole immediate release tablets were prepared by direct compression technique. For each tablet formulation drug (HSD), sodium starch glycolate, cross povidone, Croscarmellose and diluents were blended homogeneously for 8 min followed by addition of magnesium stearate and Talc. The resultant mixture was compressed into tablets in 16mm die cavities using tablet press punching machine. Nine formulations were prepared by changing the amount of the ingredients as shown in Table 2 and 3.

Table 2: Formulations of Lansoprazole Immediate Release Tablets.

S.NO	Ingredients	LF1	LF2	LF3	LF4	LF5	LF6	LF7	LF8	LF9
1	LPZ(HSD)	HSD Equivalent to 30mg								
2	SSG	50	75	100	-	-	-	-	-	-
3	CP	-	-	-	50	75	100	-	-	-
4	CCS	-	-	-	-	-	-	50	75	100
5	MCC	150	125	100	150	125	100	150	125	100
6	Talc	5	5	5	5	5	5	5	5	5
7	Mg St	5	5	5	5	5	5	5	5	5
8	Mannitol	10	10	10	10	10	10	10	10	10
	Total	250	250	250	250	250	250	250	250	250

Table 3: Formulation Chart of Lansoprazole Immediate Release Tablets (LF & LSDF).

S NO	Ingredients	LF(Wit out SD)	LSDF (Without HSD)
1	LPZ(HSD)	30	30
2	SSG	-	100
3	MCC	380	100
4	Talc	10	10
5	MgSt	10	10
6	Total	250	250

Evaluation: All the formulations were evaluated for the following parameters.

Weight variation test: 20 tablets from each formulation were randomly picked up and weighed individually and the average weight was calculated. The individual weights were then compared with the average weight.

Friability: Ten tablets were weighed and placed in a Roche friabilator and rotated at 25 rpm for 4 min. The tablets were taken out, dedusted, and reweighed. The percentage friability of the tablets was calculated using the equation:

% F = {1-(Wt/W)} ×100

Where, % F is percentage friability, W is the initial weight of tablet and Wt is the final weight of tablets after revolutions. Compressed tablets with a loss of less than 1% are generally considered acceptable.

Hardness: The hardness of core tablets was measured using Monsanto hardness tester. A total of five tablets from each formulation were taken for the study and the average of the three is reported. It is expressed in kg.

Uniformity of drug content: Drug content uniformity was determined by randomly selecting 5 tablets were powdered. The quantity equivalent to single dose of the drug was dissolved in HCL buffer solution, pH 0.1N HCL for 5 hours with occasional shaking and diluted to 50 ml with buffer. After filtration to remove insoluble residue, 1 ml of the filtrate was diluted to 10 ml with the buffer. The absorbance was measured at the required λmax using a UV visible spectrophotometer. The experiments were carried out in triplicate for all formulations and average values were recorded. The drug content was calculated using the following equation:

% Drug content = conc. (µg/ml) × Dilution factor × 100/ 50

Disintegration Time

The *in vitro* disintegration time was determined using disintegration test apparatus. Six tablets were placed in each of the six tubes of the apparatus. The time in seconds taken for complete disintegration of the tablet with no palpable mass remaining in the apparatus was measured in seconds.

In-vitro Dispersion Time

In vitro dispersion time was measured by dropping a tablet in measuring cylinder containing 6 ml of water Three tablets from each formulation were randomly selected and *Invitro* dispersion time was performed.

Wetting Time

Wetting time was measured using a simple procedure. a piece of tissue paper cut circularly (6.5cm diameter) and placed on a petric dish containing 6ml of water at room temperature. A tablet is placed on the surface of the tissue paper and the time required for complete wetting of the tablet was noted.

In-vitro dissolution study

The release rate of from Lansoprazole immediate release tablets was determined using *United States Pharmacopeia (USP)* 24 Dissolution Testing Apparatus 2 (paddle method). The dissolution test was performed using 900ml of pH 6.8 buffer, at 37±0.5°C and 50 rpm. A sample (10ml) of the solution was with-drawn from the dissolution apparatus hourly and the samples were replaced with fresh dissolution medium. The samples were diluted to a suitable concentration with pH 6.8 phosphate buffer. Absorbance of these solutions was measured at 279nm using Evolution UV-Visible double-beam spectrophotometer. Cumulative percentage drug release was calculated using an equation obtained from a standard curve.

RESULTS AND DISCUSSION

The present research work is an attempt made to formulation development for mixed hydrotropic solid dispersion immediate release tablets of LPZ. Among different solubility enhancement techniques to fulfill my object I have selected Mixed hydrotropic solid dispersion technique. Different Super disintegrants like Crospovidone, CCS, and SSG were used to Different concentrations (2.5%, 5%, 7.5%.10%) to enhance poor solubility & Immediate release action of Lansoprazole. Based on the above investigational reports I concluded following results and discussions.

Preformulation studies shows that API is Identified as LPZ. The IR Spectra of pure Lansoprazole drug, HSD, HSD with SSG, CP, CCS and the best formulation. The following peaks were observed in Lansoprazole with excipients which are shown in Figure 1 and 2. LPZ is soluble in methanol, dichloromethane and Practically insoluble in water. Melting point of LPZ was 140^0c and its wave length is 247nm. The studies on angle of repose showed that Lansoprazole (HSD) was 30^0c, On analyzing for density it was found that EFV showed bulk density value 0.530 gm/cc and tapped density value 0.660 gm/cc. The values of Carr's Index & Hausner's ratio for LPZ were found to be 15.7 & 1.18 simultaneously, indicating the good flow characteristics.

Lansoprazole was estimated using UV/VIS Spectrophotometric method. It was found that under UV/VIS Spectrophotometer Standard absorbance of the peak of Lansoprazole was 0.247 for 6 µg/ml of standard calibration curve and is shown in Figure 3.

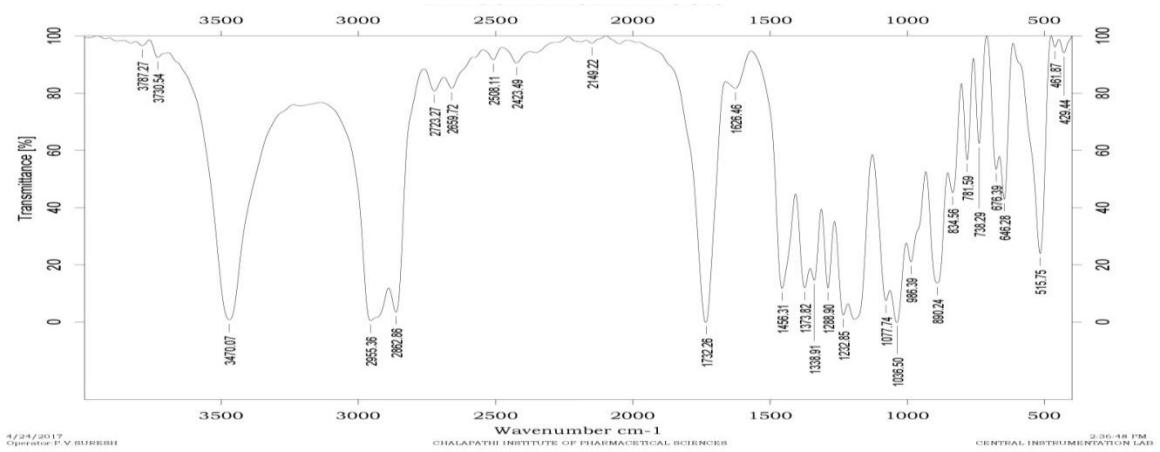

Fig. 1: IR Spectrum of Lansoprazole (pure drug).

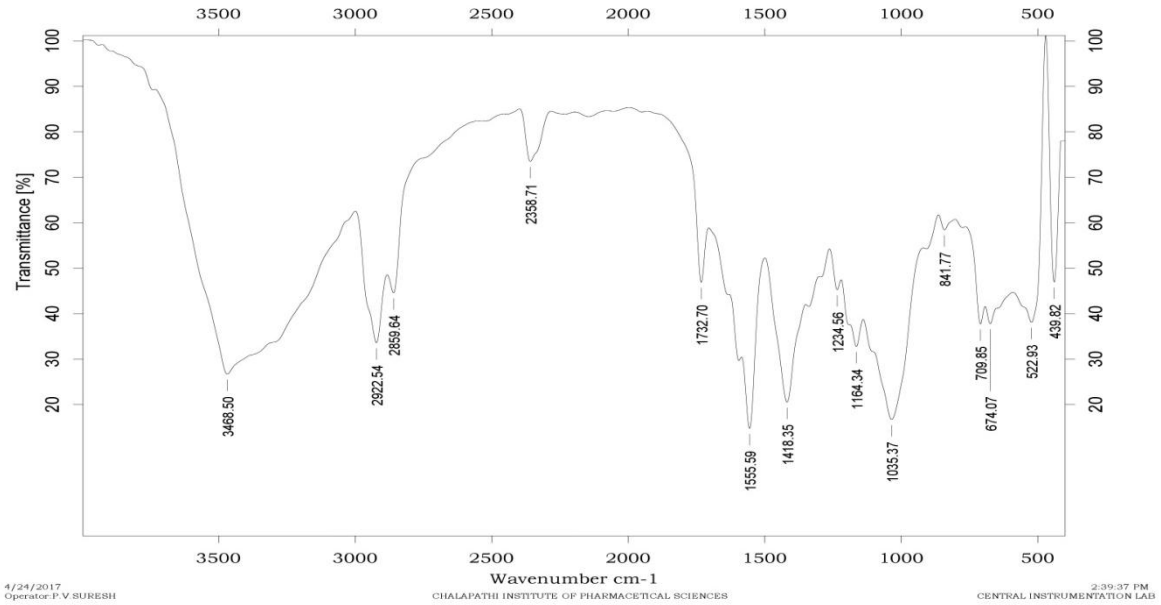

Fig. 2: IR Spectrum of mixture of LPZ, MCC, Talc and Mg St.

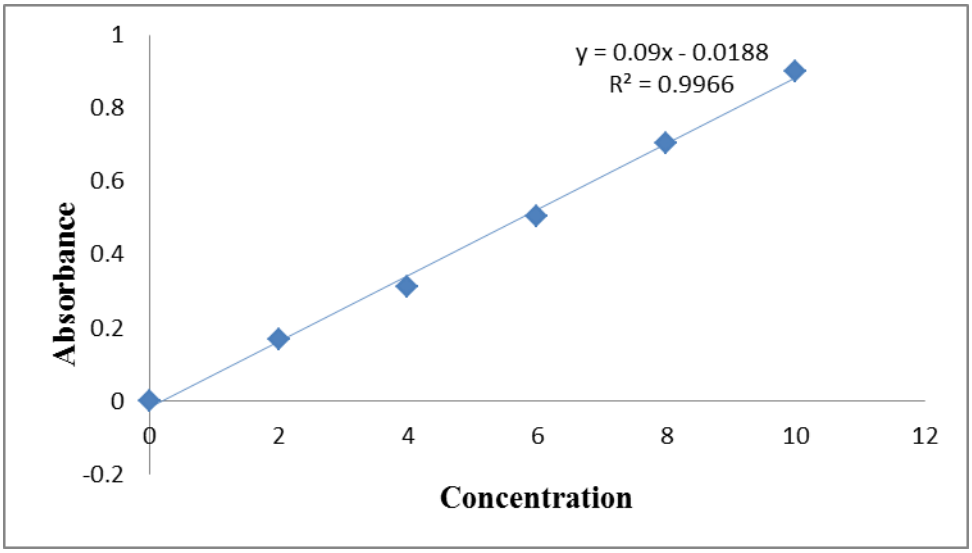

Fig. 3: Calibration curve of Lansoprazole.

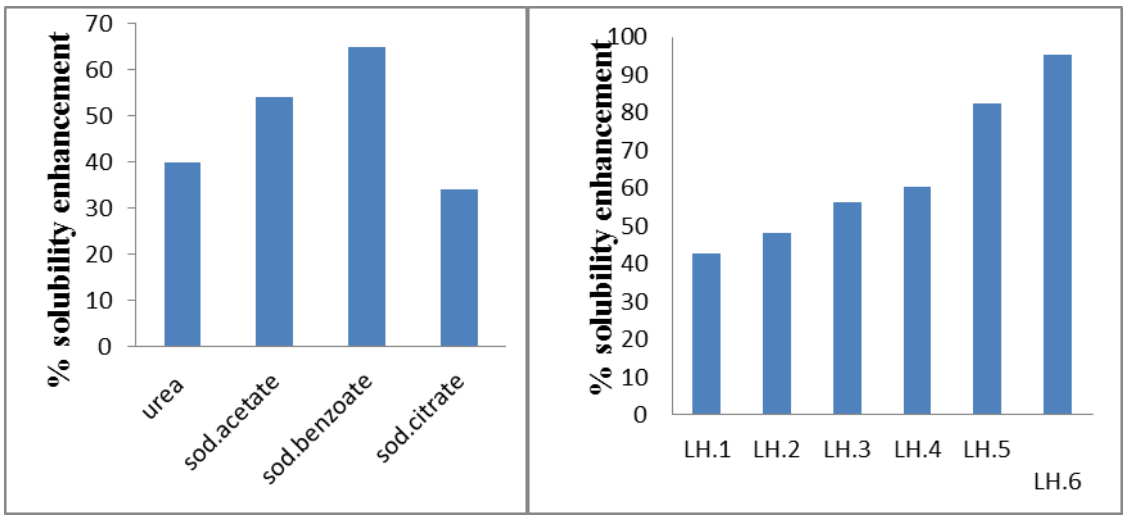

Fig. 4: Solubility Enhancement Ratio.

Solubility of Lansoprazole was enhanced by using mixed hydrotropic solid dispersion (HSD) technique by using hydrotropes such as urea, sodium benzoate, sodium acetate & sodium citrate in different ratios & is having 10% of concentration. Among these U+B+A having 1:6:1 ratio (0.125gm+0.750gm+0.125gm) of HSD shows maximum solubility enhancement of135.9% which is shown in Figure 4.

From the obtained solubility enhancement values, U+B+A blend was selected. From this HSD was prepared by taking 1:1 ratio of drug and hydrotropic blend. Then HSD formulations were developed by using Superdisintegrants such as Crospovidone, Croscarmellosesodium and Sodiumstarchglycolate in 5%,7.5%,10% concentrations followed by combinations of super disintegrannts (CP:CCS), 1:1,1:2,1:3 ratios were formulated. Among these(CP:CCS) combination exhibits higher dissolution profiles.

Direct compression was the preferred technology for the preparation of Immediate release tablets. Based on the preliminary studies various formulation trials (LF1-LF9), were carried out with different concentrations of three different superdisintegrants were used.

The preliminary studies were carried out by preparing various formulations with different process variable and subjecting the formulation to all pre-compression and post-compression parameters and are shown in Table 4 and 5.

Table 4: Pre-Compression Parameters.

Formulation	Angle of Repose (^{0})	Bulk Density (g/ml)	Tapped Density (g/ml)	Carr'sIndex (%)	Hausner Ratio
LF1	27.63±0.69	0.520±0.02	0.623±0.02	16.37±0.75	1.19±0.06
LF2	28.91±0.85	0.525±0.02	0.623±0.02	15.73±0.71	1.18±0.05
LF3	27.82±0.82	0.560±0.03	0.660±0.06	15.15±0.62	1.17±0.04
LF4	27.58±0.82	0.521±0.02	0.623±0.02	16.37±0.74	1.19±0.06
LF5	26.88±0.65	0.542±0.04	0.637±0.03	14.91±0.91	1.17±0.04
LF6	28.91±0.85	0.521±0.02	0.623±0.02	16.37±0.75	1.19±0.06
LF7	27.59±0.82	0.485±0.01	0.564±0.06	14.0±0.65	1.16±0.03
LF8	26.54±0.65	0.540±0.04	0.615±0.01	12.1±0.55	1.13±0.02
LF9	28.46±0.80	0.490±0.01	0.580±0.07	15.5±0.54	1.18±0.06

Table 5: Post-Compression Parameters.

Formulations	Wt variation(mg)	Thickness (mm)	Hardness (kg/cm^2)	Drug content (%)	Friability (%)
LF1	999.3±0.34	6.21±0.83	4.5±0.37	98.96±0.47	0.31±0.026
LF2	999.2±0.34	6.23±0.83	4.5±0.35	98.91±0.65	0.31±0.025
LF3	998.1±0.30	6.22±0.80	4.5±0.37	99.96±0.52	0.32±0.026
LF4	999.1±0.30	6.23±0.83	3.6±0.37	98.25±0.60	0.31±0.025
LF5	997.2±0.25	6.21±0.80	3.5±0.37	98.85±0.4	0.30±0.025
LF6	999.1±0.30	6.23±0.83	4.0±0.35	97.31±0.58	0.31±0.026
LF7	998.3±0.30	6.23±0.84	4.3±0.36	97.96±0.24	0.32±0.026
LF8	999.5±0.34	6.20±0.83	3.6±0.35	98.3±0.28	0.30±0.025
LF9	999.9±0.34	6.22±0.80	3.5±0.37	98.36±0.38	0.31±0.026

From the results it was observed that the bulk density values of Lansoprazole HSD formulations were found in between 0.485±0.01 to 0.560±0.03 gm/cc. The Tapped density values of Lansoprazole HSD were found in between 0.564±0.06 to 0.660±0.06 gm/cc. The compressibility Index values of Lansoprazole HSD formulations were found in between 12.1±0.55 to 16.37±0.75. The Angle of repose values of Lansoprazole HSD formulations were found in between 26.54±0.65 to 28.91±0.85º. From the above investigational reports all the HSD formulations of LPZ shows good flow properties.

Hardness of the developed formulations varies from 3.3±0.36 kg/cm^2 to 4.5±0.38 kg/cm^2 for hydrotropic solid dispersions. Thickness of the LPZ solid dispersions varied from 6.20±0.83 to 6.33±0.83 mm. The average weight of twenty tablets of LPZ was calculated for each formulation which varied from 997.2 to 999.5 mg, which compiles the official requirement as per IP. Friability of the developed formulations varied from 0.29 ±0.023% to 0.32±0.024% loss for LPZ which was less than 1% as per official requirement of IP. The drug content was estimated for all the formulations and the results obtained between the range 90 to 99.37%. All the formulations were found within the limit.

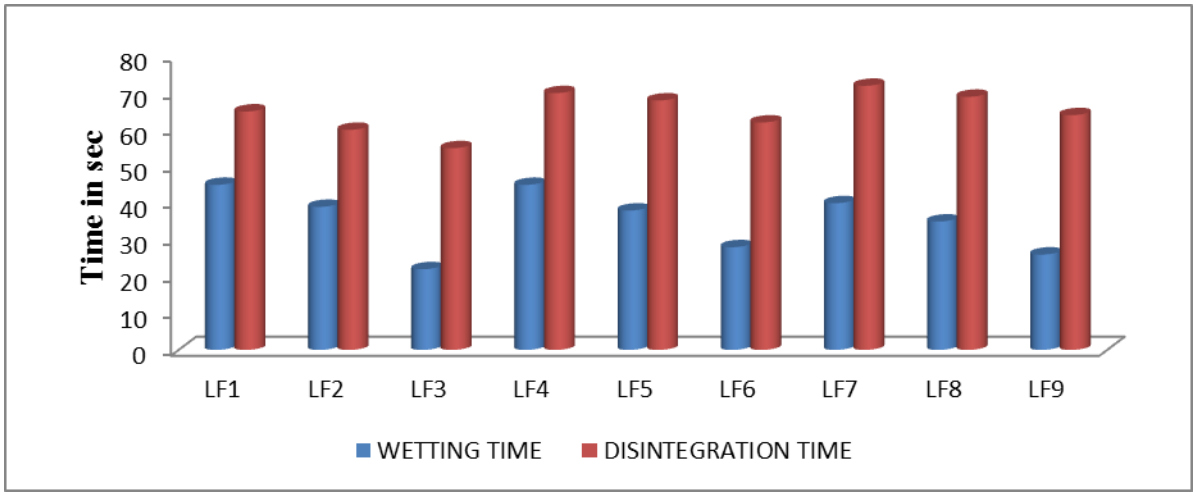

Fig. 5: Wetting time & disintegration time of designed formulations.

The most important parameter that needs to be optimized in the development of Immediate release tablets is the disintegration time of tablets. In the present study disintegration time of all batches were found. Among them, formulations with super disintegrants disintegrate in the range of 89 sec to 240 sec and for the formulation without super disintegrants shows disintegration with in 176 sec, fulfilling the official requirements. In the present study wetting time of all batches were found. Among them, formulations with super disintegrants, wetting time is in the range of 45 sec to 150 sec and for the formulation without super disintegrants shows wetting time with in 60 sec, fulfilling the official requirements. Wetting time and disintegration values are shown in Figure 5.

The post compression parameters like Hardness, Friability, Disintegration time, Weight variation, wetting time values were found to be within the IP limits.

HSD formulations of LPZ were prepared and optimized by taking different parameters into consideration. LF1-LF9 Formulations SSG, CP & CCS as Super Disintegrants in 2.5, 5 & 7.5% concentration were formulated by direct compression. Sodium starch glycolate is used as the super disintegrate in the formulation LF1 – LF3 at the concentrations of 2.5%, 5%, 7.5% respectively. Maximum drug release is seen with LF3(SSG) 98.1% at the end of 25 min. Cross-povidone is used as the super disintegrate in the formulation LF4– LF6 at the concentrations of 2.5%, 5%, 7.5% respectively. Maximum drug release is seen with LF6(CP), 98.5% at the end of 30 min. Croscarmellose is used as the super disintegrate in the formulation LF7-LF9 at the concentrations of 5%,7.5%,10%, respectively. Maximum drug release is seen with LF9(CCS), 97.5% at the end of 30 min. So from these studies the drug release is better LF3 Formulation hence SSG was selected as better superdisintegrants than other for lansoprazole. Drug release data can be observed from the following Table 6 and Figure 6.

Table 6: %Drug Release Of LF1 To LF9 Formulations.

SNO	TIME (MIN)	LF1	LF2	LF3	LF4	LF5	LF6	LF7	LF8	LF9
1	5	35.6	43.7	45.6	29.3	32.3	37.5	33.6	40.1	44.7
2	10	56.1	64.9	65.6	49.5	52.5	58.3	52.8	61.6	64.9
3	15	65.6	75.0	78.6	59.3	63.2	69.2	62.3	72.0	75.0
4	20	81.8	85.3	90.0	73.5	79.3	81.3	78.8	85.3	81.7
5	25	88.7	91.5	98.0	83.6	86.3	92.5	82.2	91.6	94.5
6	30	94.5	97.5		90.1	93.2		92.9	94.5	

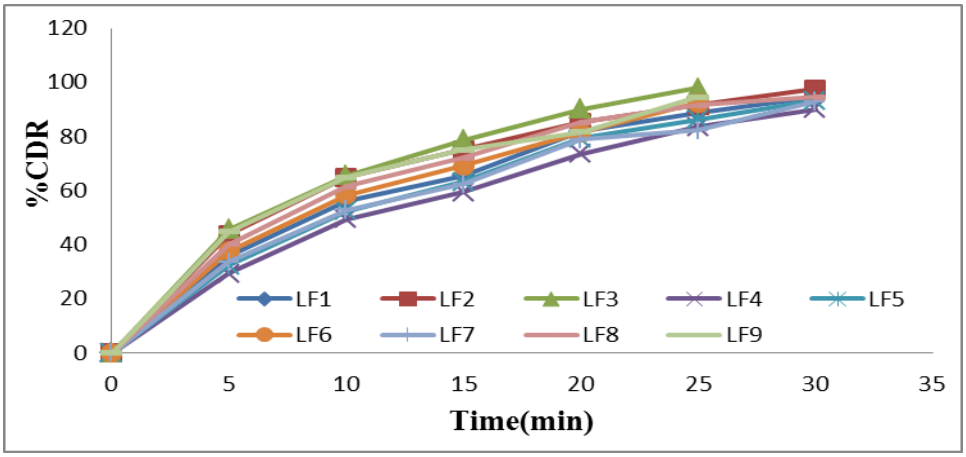

Fig. 6: %CDR graph for LF1 To LF9 Formulations.

Table 7: Comparison %Drug Release of LF, LSDF Formulations with LF3.

S.NO	TIME	HLF (without SD)	LSDF (with SD)	LF3
1	5	5.6	10.2	
2	10	10.8	18.2	
3	15	16.4	26.8	45.6
4	20	20.8	32.1	65.6
5	25	30.6	38.4	78.6
6	30	38.2	46.2	90
7	40	48.2	62.2	98
8	50	55.3	75.8	
9	60	60.2	91.6	

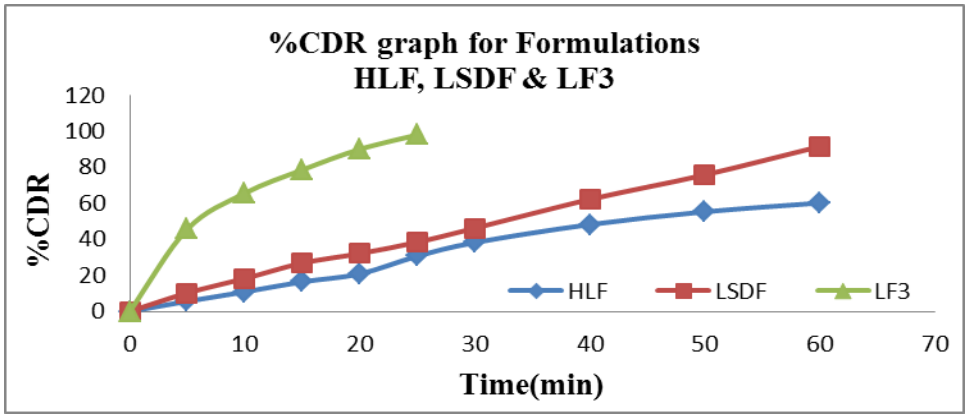

Fig. 7: % CDR graph for HLF, LSDF & LF3 Formulations.

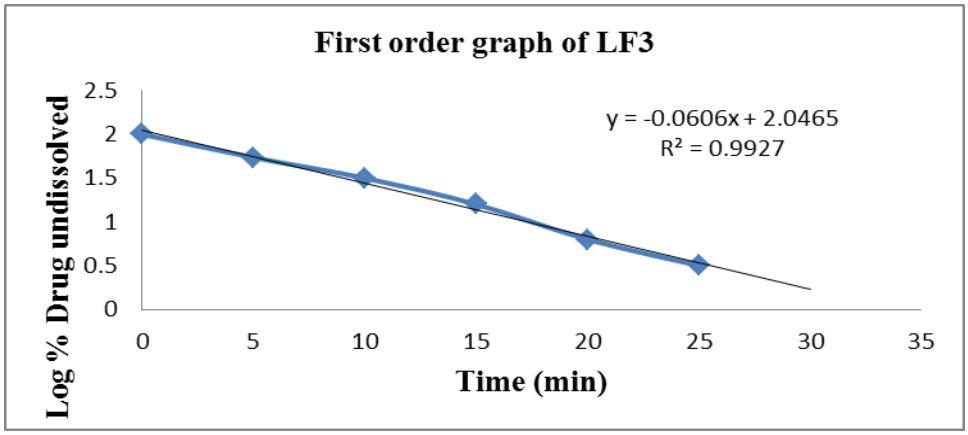

Fig. 8: First order graph of LF3.

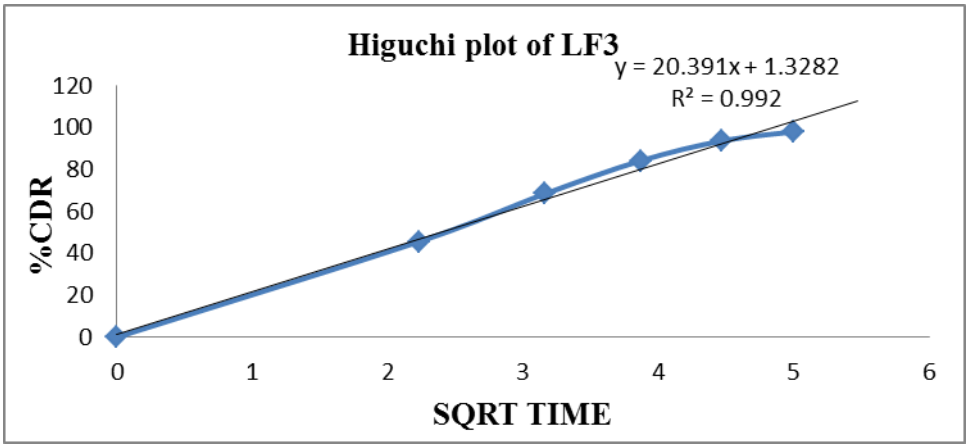

Fig. 9: Higuchi plot of LF3.

Finally the best formulation was compared with pure drug formulation, HSD formulation without any super disintegrants & marketed formulation. Pure drug formulation HLF shows maximum drug release of 60.2% at the end of 60 min. HSD formulation without super disintegrant (LSDF) shows maximum drug release of 81.2% at the end of 60 min and finally conducted marketed tablet dissolution test, shows maximum drug release of 91.6% at the end of 60 min.

Among all these formulations LF3 shows best release of 98.0% at the end of 25 min. The data obtained from the comparison of hydrotropic mixture without super disintegrants and pure drug formulation, drug with super disintegrants with that of optimized formulation LF3 it was revealed that the optimized formulation LF3 shows better results than that of all mentioned above.

DISCUSSION

From above all the studies, The IR studies reveal that there is no interaction of drug and excipients. Enhancement of solubility was done by using hydrotropic solid dispersions. Further the formulations were designed with different concentrations of superdisintegrants. In these formulations drug release was increased with an increase in concentration of superdisintegrants used in this investigation. Among These different formulations it was found that SSG shows better drug release. Among all these formulation containing (1:3) % SSG LF3 shows the percentage drug release of 98.0% at the end of 25 min. which satisfied all the tablet evaluation parameters mixed hydrotrophy immediate release tablets. Hence looking at all the satisfactory parameters LF3 batch is selected as the optimized batch. Further it was confirmed by comparing the results with pure drug formulation, HSD formulation without superdisintegrants and pure drug with super disintegrants. Effect of Hydrotropic solid dispersions on solubility enhancement of Lansoprazole shows satisfactory results. In overall study suggests that LPZ mixed hydrotropic solid dispersion immediate release tablets can be formulated by direct compression. It provides quick onset of action due to rapid dissolution of the dosage form which in turn provides patient compliance of taking the medication.

CONCLUSION

The present study has resulted in solubility enhancement and development of novel dosage form of class II drug using mixed hydrotropic solid dispersion techniques for better drug release and therapeutic action. To further enhance the dissolution rate of HSD of Lansoprazole immediate release tablets by using super disintegrants were prepared. Among all these formulations, after comparing the solubility and dissolution profile it was found LF3 give desired dissolution profile of Lansoprazole more than 98% release in 25 min. kinetics of in vitro drug release of optimized formulation LF3 found to follow Peppa's kinetic model having highest R^2 value with drug release mechanism as anamolous diffusion coupled with erosion. The present research work concludes that the hydro trophy is a novel, safe and effective away to enhance solubility of poorly aqueous soluble drugs. Immediate dissolution of practically insoluble drug Lansoprazole in aqueous dissolution media indicates at great potential to solubilize the drug in biological fluids, and thus appreciable enhancement in bioavailability and onset of action can be expected.

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