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FORMULATION AND EVALUATION OF FAST DISSOLVING FILMS OF LERCANIDIPINE HYDROCHLORIDE

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ABSTRACT

Hypertension became a major cause of concern not just in elderly but also in the youngsters since it is one of the largest deaths causing disease for the mankind. The disadvantages of most of the antihypertensive drugs such as more frequent administration, extensive first pass metabolism, therapeutic inefficacy and variable bioavailability, make them ideal candidates for fast dissolving film formulation. Lercanidipine Hydrochloride, a potent antihypertensive and antianginal drug is rapidly and almost completely absorbed from the gastrointestinal tract following oral administration. However, absolute bioavailability is reduced to approximately 10% because of extensive first pass metabolism to inactive metabolites. In the present study, Lercanidipine hydrochloride fast dissolving films were formulated by solvent-casting method containing HPMC E15, PVA as polymers and sodium starch glycolate, crospovidone as superdisintegrants. Formulation HF2 with HPMC E15 and crospovidone is considered as the optimized formulation as it showed faster disintegration rate (28sec), maximum in vitro drug release i.e., 98.84% within 10mins. No significant changes were observed during stability studies for the optimized formulation. It was concluded that Lercanidipine hydrochloride fast dissolving oral films can be formulated as a potentially useful tool for an effective treatment of hypertension and management of angina pectoris with improved bioavailability, rapid onset of action and with increased patient compliance.

KEY WORDS: Lercanidipine Hydrochloride, Fast dissolving film, Solvent-casting method.

INTRODUCTION

From past few decades there is a tremendous change in designing various drug delivery systems to achieve rapid onset of action in order to treat sudden surprising disorders like hypertensive reactions. Travelling through various milestones from discovering a conventional tablet, capsule, modified release tablet and capsules, oral disintegrating tablets, wafers to achieve oral drug administration and now aspiring another milestone in novel era of formulating fast dissolving films. Fast dissolving films (FDFs) are the most advanced form of oral solid dosage form since they improve the efficacy of APIs by dissolving within a minute in oral cavity after the contact with less saliva as compared to fast dissolving tablets, without chewing and no need of water for administration. It gives quick absorption and instant bioavailability of drugs due to high blood flow and permeability of oral mucosa which is 4-1000 times greater than that of skin [1].

Hypertension became a major cause of concern not

just in elderly but also in the youngsters since it is one of the largest deaths causing disease for the mankind. Conventional dosage forms are not suitable where quick onset of action is required. To provide the patients with the most convenient mode of administration, there is a need to develop rapidly dissolving dosage form, particularly one that disintegrates and dissolves/disperses in saliva and can be administered without the need of water. The disadvantages of antihypertensive drugs such as more frequent administration, extensive first pass metabolism, therapeutic inefficacy and variable bioavailability, make them ideal candidates for fast dissolving oral film formulation [2].

Lercanidipine Hydrochloride (LRHL), a potent antihypertensive and antianginal drug is chemically 2-[(3, 3-diphenylpropyl) methylamine]-1, 1-dimethylethylmethyl 1, 4-dihydro-2, 6-dimethyl-4-(3-nitrophenyl)-3, 5 pyridine carboxylic ester hydrochloride. It is used in treatment of hypertension, because of its selectivity and specificity on

the smooth vascular cells. The drug is administered orally in a dose of 10–20 mg daily as its hydrochloride salt, reducing significantly the diastolic blood pressure. After oral administration, Lercanidipine hydrochloride is completely and erratically absorbed from the gastrointestinal tract. However, absolute bioavailability is reduced to approximately 10% because of extensive first pass metabolism to inactive metabolites. Mean half-lives of 2.8 and 4.4 h in humans after single dose of 10 and 20 mg of LRHL, respectively [3-6]. These pharmacokinetic parameters make LRHL a suitable candidate for fast dissolving film formulation.

Thus, the main objective of the investigation was to formulate oral fast dissolving films containing, Lercanidipine hydrochloride by solvent casting method which is simple and cost-effective to minimize the first pass effect, increase the oral bioavailability, to provide rapid onset of action thereby increasing patient compliance.

MATERIALS AND METHODS

Materials

Lercanidipine hydrochloride, HPMC E15, PVA, Sodium starch glycolate, Croscopovidone, Propylene glycol, Citric Acid, Sucrose, Vanillin were arranged by Chandra Labs, Hyderabad.

Methods

Drug polymer compatibility studies

FT-IR Studies are performed to ascertain the compatibility of the Lercanidipine Hydrochloride with the selected polymers. Infrared spectrum of Lercanidipine Hydrochloride and physical mixture of drug and polymer was determined on Fourier Transform Infrared Spectrophotometer (8400s Shimadzu) using KBr dispersion method.

U.V Spectrum Analysis of Lercanidipine Hydrochloride

10mg of Lercanidipine Hydrochloride was dissolved in 10 ml of methanol. From the stock solution 10 μ g/ml was prepared in methanol and the solution was scanned in the range of 200 to 400 nm to fix the maximum wave length and UV spectrum was obtained.

Standard plot of Lercanidipine Hydrochloride in pH 6.8 Phosphate buffer

From the standard stock solution (1000 μ g/ml), appropriate aliquot were transferred to series of 10 ml volumetric flasks and made up to 10 ml with pH 6.8 Phosphate buffer so as to get concentration of 2, 4, 6, 8, 10 μ g/ml. The absorbances of the solutions were then measured on a double beam UV-Visible Spectrophotometer at λ_{max} of 238 nm against the respective blank. A calibration graph was plotted and shown in figure no 4.

Method of preparation of fast dissolving film of Lercanidipine Hydrochloride [7]

Films were prepared by solvent casting method. Lercanidipine Hydrochloride Fast dissolving films were prepared using polymers like HPMC E-15, polyvinyl alcohol. The formulation codes and their respective concentrations are given in Table no 2(i) & 2(ii). An aqueous solution of polymer was prepared by dissolving in a fixed quantity of distilled water. To this polymeric solution, propylene glycol and other excipients were added in appropriate quantities. Drug was dissolved in small quantity of methanol and added to the above polymer-plasticizer solution and mixed thoroughly using a magnetic stirrer at 80-90rpm. The solution was kept undisturbed for removal of air bubbles and was sonicated. Finally a measured quantity of the above solution was poured in to the casting bangles which are pre-wrapped with the aluminum foil and dried overnight at room temperature. The dried films were cut into squares of 6.25 cm² and stored in air tight containers wrapped in butter paper and aluminum foil for further analysis.

EVALUATION OF THE FILMS

Weight variation of the film [8]

6.25cm²film was cut at different places in the cast film. The weight of each filmstrip was taken and the weight variation and standard deviation (SD) was calculated.

Thickness of the film [9]

The thickness of the patch was measured using digital Vernier Calipers with a least count of 0.01 mm at different spots of the film. The thickness was measured at three different spots of the patch and average was taken and SD was calculated.

Tensile strength [10]

Tensile testing was conducted using a texture analyzer AG/MC1 (Acquati, Italy), equipped with a 5 N load cell. The film was cut into 30 × 20 mm strips. Tensile tests were performed according to ASTM International Test Method for Thin Plastic Sheeting (D 882-02). Each test strip was placed in tensile grips on the texture analyzer. Initial grip separation was 20 mm and crosshead speed was 1 inch/min. The test was considered concluded when the film breaks. Tensile strength (TS) is the maximum stress applied to a point at which the film specimen breaks and can be calculated by dividing the maximum load by the original cross-sectional area of the specimen and it was expressed in force per unit area (MPa).

Tensile Strength = Force at break (N)/ Cross sectional area (mm²)

Folding endurance [11]

The folding endurance is expressed as the number of folds (number of times of film is folded at the same plain) required breaking the specimen or developing visible cracks.

Disintegration time [12]

Disintegration time test was performed by placing 6.25cm² film in a beaker and 25ml of 6.8 P^H Phosphate buffer was added to the beaker with swirling action every 10secs. The disintegration time is the time when the film starts to break or disintegrate.

Surface P^H [13]

The surface pH of FDOF is determined in order to investigate the possibility of any side effects in vivo. As an acidic or alkaline pH may cause irritation to the oral mucosa, it is determined to keep the surface pH as close to neutral as possible. A combined pH electrode is used for this purpose. Film is slightly wet with the help of water. The pH is measured by bringing the electrode in contact with the surface of the oral film. This study is performed in triplicate and mean \pm S.D calculated.

Content uniformity [14]

Strip of size (2.5*2.5cm²) were cut, placed in 100ml phosphate buffer 6.8 P^H and dissolved and kept on magnetic stirrer for 1hr. solution was filtered and suitably

diluted. The absorbance of the solution was measured at 238 nm. The determination was carried out in triplicate for all the formulations.

In vitro Dissolution Studies [15]

Dissolution study was carried out using USP type I (basket apparatus) with 900 ml of 6.8 pH phosphate buffers as dissolution medium maintained at 37 \pm 0.5⁰ C. Medium was stirred at 50 rpm for a period of 30 minutes. Samples were withdrawn at every 2 min interval up to 20 min, replacing the same amount with the fresh medium. Lercanidipine Hydrochloride in the samples were then determined spectrophotometrically at 238nm.

Stability Studies [16]

Stability Studies were performed at temperature of 40 \pm 2⁰C/75% RH for 3 months in Stability chamber. Each film was wrapped in a butter paper followed by aluminum foil and sealed in an air-tight plastic pouch. The films were evaluated for physical parameters, *in vitro* disintegration time and drug content for 30days, 60days and 90 days after storage.

RESULTS AND DISCUSSIONS

Table 1. Standard plot of Lercanidipine Hydrochloride in 6.8 pH phosphate buffer
Standard plot of Lercanidipine Hydrochloride in PH 6.8 Phosphate buffer

S.No	Concentration (μ g/ml)	Absorbance(nm)
1	2	0.015
2	4	0.032
3	6	0.047
4	8	0.063
5	10	0.077

Table 2(i). Composition of various oral thin film formulations

Formulation Code	Drug(mg/6 .25cm ²)	HPMC E-15	PVA	Propylene Glycol*	SSG	Citric Acid	Vanillin	Sucrose	Water
F1	10	100	-	15	10	5	5	5	q.s
F2	10	200	-	30	10	5	5	5	q.s
F3	10	300	-	45	10	5	5	5	q.s
F4	10	400	-	60	10	5	5	5	q.s
F5	10	-	200	30	10	5	5	5	q.s
F6	10	-	300	45	10	5	5	5	q.s
F7	10	-	400	60	10	5	5	5	q.s

All weights except water are in milligrams (mg); Propylene Glycol* – 15% weight of the polymer; SSG-Sodium Starch Glycolate; Formulation F1 was unable to peel off from the casting surface, so it was rejected from further evaluation tests.

Table 2(ii). Composition of various oral thin film formulations

Formulation Code	Drug (mg/6.25cm ²)	HPMC E-15	PVA	Propylene Glycol**	CP	Citric Acid	Vanillin	Sucrose	Water
HF1	10	200	-	20	10	5	5	5	q.s
HF2	10	300	-	30	10	5	5	5	q.s
HF3	10	400	-	40	10	5	5	5	q.s
PF1	10	-	200	20	10	5	5	5	q.s
PF2	10	-	300	30	10	5	5	5	q.s
PF3	10	-	400	40	10	5	5	5	q.s

All weights except water are in milligrams (mg); Propylene Glycol** - 10% of the Polymer weight; CP-Crospovidone; q.s-Quantity Sufficient.

Table 3(i). Evaluation of physiochemical parameters of Lercanidipine Hydrochloride FDFs

Evaluation Parameter	F2	F3	F4	F5	F6	F7
Weight variation (mg)	41.58+0.45	52.64+0.600	69.18+0.473	36.64+0.752	48.49+0.668	57.73+0.935
Thickness (mm)	0.08+0.005	0.14+0.005	0.18+0.005	0.07+0.008	0.11+0.005	0.16+0.005
Folding endurance	113.6+ 6.91	158.3+7.41	182.66+3.85	133.33+ 5.79	183.6+4.36	225.3+5.73
Tensile Strength (Mpa)	2.3	4.37	4.89	2.9	4.8	5.1
Disintegration Test (sec)	38	40	51	41	49	55
Drug Content (%)	98.59+0.935	100.21+1.00	99.78+0.556	97.87+1.53	95.80+0.858	95.51+1.618
Surface P ^H	6.88+0.04	6.81+0.03	6.9+0.07	6.73+0.048	6.8+0.02	6.82+0.037

All values are represented as Mean + S.D (n=3)

Table 3(ii). Evaluation of physiochemical parameters of Lercanidipine Hydrochloride FDFs

Evaluation Parameter	HF1	HF2	HF3	PF1	PF2	PF3
Weight variation (mg)	40.18+0.951	51.98+0.634	68.6+0.996	37.97+0.54	47.09+2.17	55+1.290
Thickness (mm)	0.07+0.012	0.12+0.008	0.16+0.008	0.05+0.011	0.09+0.005	0.13+0.016
Folding endurance	95.66+1.70	143.66+3.17	175.6+4.10	107+5.099	154+8.14	196+7.408
Tensile Strength (Mpa)	1.80	3.83	4.32	2.8	3.10	4.28
Disintegration Test (sec)	26	28	44	35	42	46
Drug Content (%)	98.34+0.277	98.57+0.608	97.71+1.05	98.68+0.36	98.40+0.97	98.53+0.81
Surface P ^H	6.86+0.01	6.83+0.01	6.94+0.01	6.65+0.02	6.72+0.02	6.79+0.02

All values are represented as Mean + S.D (n=3)

Table 4(i). In vitro dissolution of formulations (F2-F7) in pH 6.8 phosphate buffer

Time	F2	F3	F4	F5	F6	F7
2min	46.34	29.79	20.29	19.38	16.37	17.08
4min	58.27	42.47	39.94	35.49	31.84	33.42
6min	62.19	57.71	56.47	45.79	43.28	41.39
8min	74.56	69.15	64.69	53.91	49.35	44.71
10min	83.35	76.77	74.25	68.19	62.72	59.93
12min	93.34	88.2	84.39	79.32	74.58	68.47
14min	97.46	95.78	91.37	83.53	81.34	79.29
16min		98.35	96.42	87.49	85.33	84.91
18min			97.71	93.54	90.96	88.40
20min			98.28	96.39	95.98	92.74

Table 4(ii). In vitro dissolution of formulations (HF1-PF3) in pH 6.8 phosphate buffer

Time	HF1	HF2	HF3	PF1	PF2	PF3
2min	49.5	40.59	36.72	24.25	22.98	21.0
4min	72.27	67.22	64.64	50.34	49.08	39.13
6min	91.37	84.94	82.46	71.48	69.01	56.55
8min	97.71	95.13	91.56	82.06	80.17	77.69
10min		98.84	93.85	93.26	92.63	89.53
12min			96.42	96.36	94.47	92.0
14min			97.98	97.0	97.58	95.10
16min						98.84

Table 5. Stability Studies for Formulation HF2

Evaluation Parameter	Duration			
	0 days	30days	60days	90days
Folding Endurance	143	138	131	126
Disintegration Time (sec)	28	28	30	32
Drug Content (%)	98.57	98.22	97.71	96.42

Figure 1. FTIR Spectrum of Lercanidipine

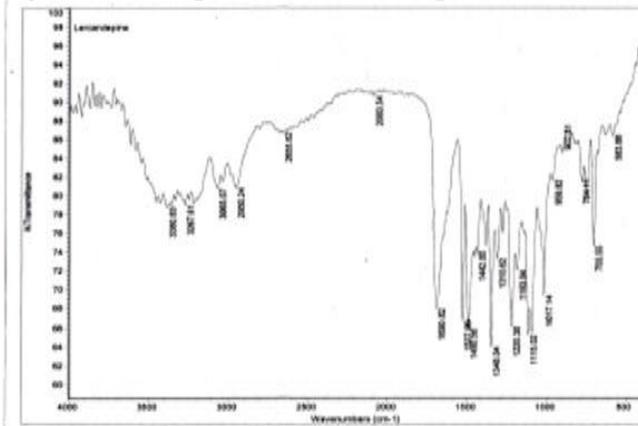
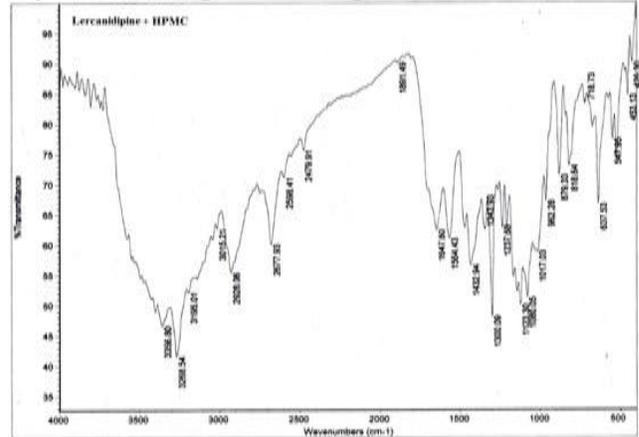


Figure 2. FTIR Spectrum of Optimized formulation



UV Spectrum Analysis of Lercanidipine Hydrochloride
Figure 3. UV Spectrum Analysis of Lercanidipine Hydrochloride

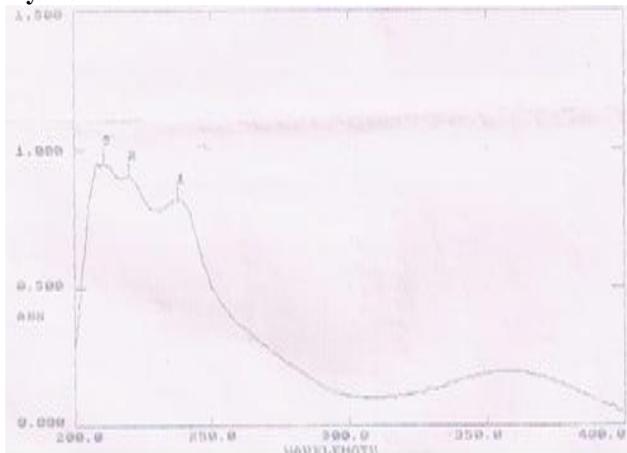


Figure 4. Standard Curve of Lercanidipine Hydrochloride in 6.8 pH phosphate buffer

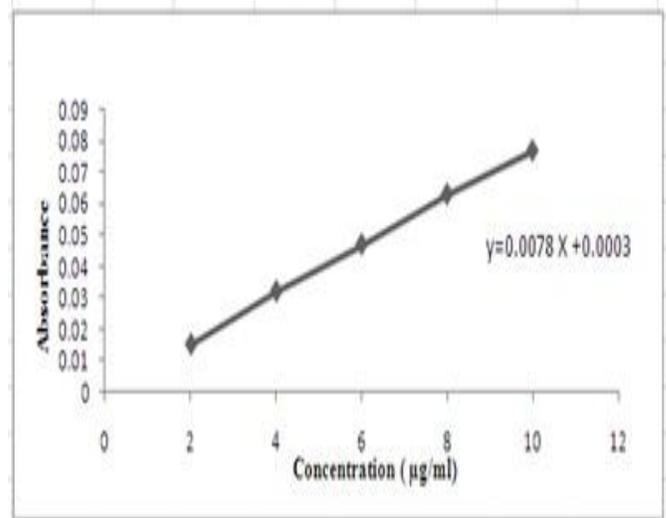


Figure 5. Graphical representation of evaluated physicochemical parameters of Lercanidipine Hydrochloride FDFs (F2-F7)

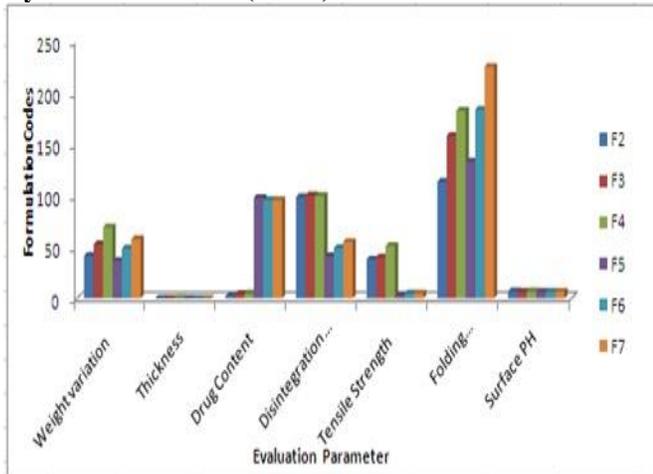


Figure 6. Graphical representation of evaluated physicochemical parameters of Lercanidipine Hydrochloride FDFs (HF1-PF3)

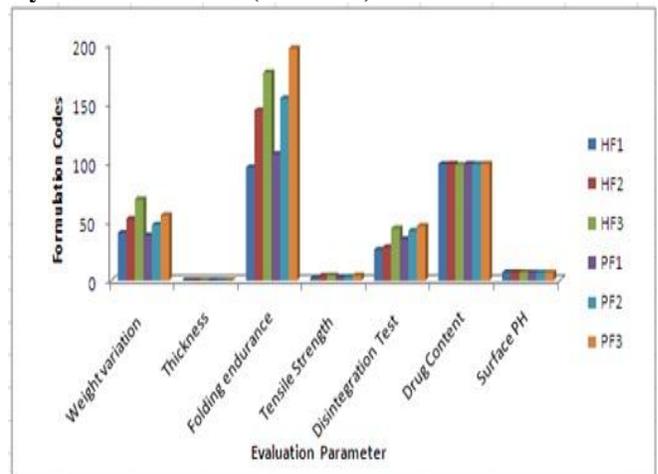


Figure 7. In vitro dissolution drug release profile of formulations (F2-F7)

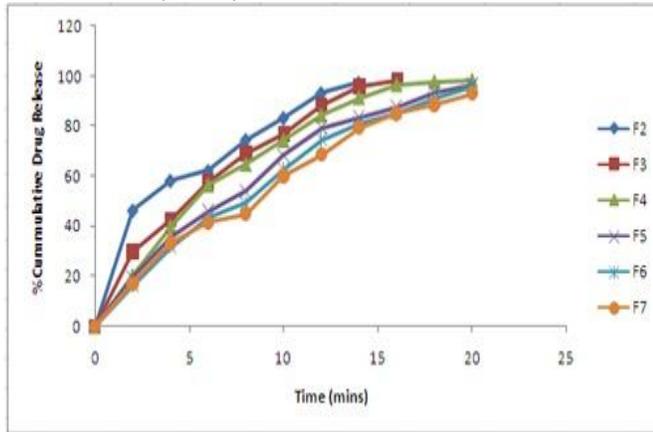


Figure 8. In vitro dissolution drug release profile of formulations (HF1-PF3)

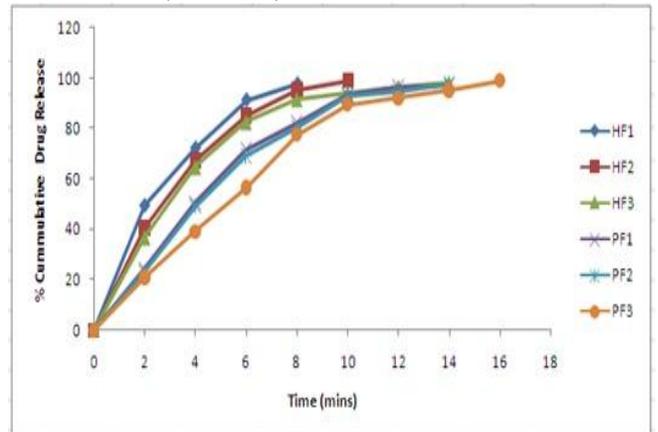


Figure 9. Formulations of Lercanidipine Hydrochloride Fast Dissolving films using different polymers



DISCUSSION

Weight variation of the films

Increase in the percentage of the polymer showed an increase in the weight of the films. Weight variation ranged from 40.18+0.951 mg to 69.18+0.473 mg for HPMC E15 films and 36.64+0.752 mg to 57.73+0.935 mg for PVA films.

Thickness of the films

As all the formulations contain different amount of polymers, the thickness was gradually increased with amount of the polymers. HPMC E-15 films were found to be thicker than PVA films. Thicknesses of all films were represented in tables above in terms of mean+S.D.

Tensile strength

Tensile strength was found to increase with increase in concentration of the polymers. Tensile strength range of the films varied from 1.8 to 4.89 for HPMC E-15 films and 2.80 to 5.1 for PVA films. Formulation HF2 found to show optimum elasticity and flexibility.

Folding endurance

Folding endurance measures the ability of film to withstand rupture. Folding endurance increased with the increase in concentration of polymers and plasticizer. Highest folding endurance was shown by formulation F7 (225.3+5.73). Least folding endurance was shown by formulation HF1 (95.66+1.70).

Disintegration time

Increase in the polymer concentration increased the disintegration time. While for a fixed polymer concentration crospovidone resulted in faster disintegration of the films. Films with crospovidone as superdisintegrant showed quick disintegration than films with sodium starch glycolate. Disintegration time of HPMC E-15 films varied from 38-51 sec (F2-F4), 26-44 sec (HF1-HF3). Disintegration time of PVA films varied from 41-55 sec (F5-F7), 35-46 sec (PF1-PF2). HPMC E15 films showed quick disintegration than the PVA films.

Surface P^H of the films

The surfaces PH of all films were found to be in the range of 6.65+0.02 to 6.94+0.01. It assured that there will not be any kind of irritation to the mucosal lining of the oral cavity.

Drug Content of the films

Homogeneous uniform drug distribution is one of the important characteristics of a fast dissolving film that ensures the uniform reproducible release of the drug from the film. Estimation of the drug content indicated that the drug is uniformly distributed throughout the film for most of the films, evidenced by the low values of the SD. Drug

content of the films with all polymers was found to be in the range of 97.71+1.05 to 100.21+1.00 for HPMC E15 films and 95.51+1.618 to 98.68+0.36 for PVA films.

In vitro Dissolution Studies

For all polymers used in the formulations, it was observed that films formed by higher quantity of polymer showed slower dissolution rate which can be attributed to the fact that increase in the level of polymer, results in formation of high viscous gel layer caused by more intimate contact between the particles of the polymer resulting in decreased mobility of the drug particles in swollen matrices thus finally leading to a decrease in release rate. Formulations HF1, HF2, HF3, PF1, PF2, PF3 containing crospovidone and 10% PG showed comparatively quick drug release than Formulations F2, F3, F4, F5, F6, F7 F5, F6, F7 containing sodium starch glycolate as superdisintegrant and 15% PG. Among all formulations, Formulation HF2 showed maximum drug release of 98.84% within 10mins.

Stability Studies

Stability Studies for the optimized formulation (HF2) was carried out in order to determine the physical stability of the formulation. The results were shown in table 5. There was no significant change in the parameters which are evaluated during the study period in the accelerated conditions.

CONCLUSION

Fast dissolving films of Lercanidipine hydrochloride were prepared by solvent casting method containing HPMC E15 and PVA polymers, using sodium starch glycolate and crospovidone as superdisintegrants. It was noticed that films with crospovidone as superdisintegrant showed quick disintegration than films with sodium starch glycolate. Formulation HF2 containing 3% HPMC E15, crospovidone and 10% propylene glycol is considered as the optimized formulation as it showed suitable satisfactory physiochemical characteristics, faster disintegration rate, maximum *in vitro* drug release. Stability studies indicated no significant changes in the film characteristics.

From the present work, it was concluded that fast dissolving film formulation can be an innovative and promising approach for the delivery of Lercanidipine Hydrochloride with improved bioavailability, enhanced dissolution rate, taste masking, with better patient compliance and as an effective therapy for the treatment of hypertension and management of angina pectoris.

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REFERENCES

1. Nehal Siddiqui MD, Garima Gard, Pramod Kumar Sharma. A Short Review on a Novel Approach in Oral Fast Dissolving Drug Delivery System and Their Patents. *Advances in Biological Research*, 5(6), 2011, 291-303.
2. Panner Selvam R, Anoop Kumar Singh, Sivakumar T. Transdermal drug delivery systems for antihypertensive drugs - A review. *Int J Pharm Biomed Res*, 1(1), 2010, 1-8.
3. Barchielli. M, Dolfini. E, Farina. P, Clinicl pharmacokinetics of lercanidipine. *J CardiovascPharmacol*, 29, 1997, 1–15.
4. Mamatha T, VenkateswaraRao J, Mukkanti K, Ramesh G. Development of matrix type transdermal patches of lercanidipine hydrochloride, physicochemical and in-vitro characterization. *Daru*, 18(1), 2010, 9 -16.
5. Shrikant Charde, MadriMudgal, Lajwinder Kumar, Ranendra Saha. Development and Evaluation of Buccoadhesive Controlled Release Tablets of Lercanidipine. *American Association of Pharmaceutical Scientists*, 9(1), 2008, 182-89.
6. Subhash P.G, Dinesh B.M, Ravikumar M. Assessment of Lercanidipine Hydrochloride for Transdermal Delivery, Physiochemical, *in-vitro* and *ex-vivo* Characterization of Matrix type Lercanidipine Hydrochloride Transdermal Patches *International Journal of Pharma and Bio Sciences*, 3(1), 2012, 349-65.
7. Swapnali V Bande P.VKasture, VaibhavVaidya. Development of Mouth Dissolving Film of Verapamil Hydrochloride, Effect of Formulation Variables. *International Journal of Universal Pharmacy and Bio Sciences*, 2(4), 2013, 348-57.
8. Khanusiya A. Qadir, Charyulu RN, Prabhu P, Bhatt S,Shastry CS. Formulation and Evaluation of fast Dissolving Films of Loratidine for Sublingual Use. *International Research Journal of Pharmacy*, 3(7), 2012, 157-161.
9. D.Karthikeyan, Sanju Sri, Santhosh Kumar. Development of Fast Dissolving Oral Film Containing of Rizatriptan Benzoate as an antimigraine medication. *Indo American Journal of Pharmaceutical Research*, 3(3), 2013, 2642-54.
10. Bhyan Bhupinder, Jangra Sarita. Formulation and evaluation of fast dissolving sublingual films of Rizatriptan Benzoate. *International Journal of Drug Development &Research*, 4(1), 2012, 133-43.
11. Prabhakara Prabhu, Ravi Malli, Marina Koland, K Vijayanarayana, Ullas DSouza, Harish NM, CS Sastry, RN Charyulu. Formulation and evaluation of Fast Dissolving Films of Levocitrizine di hydrochloride. *International Journal of Pharmaceutical Investigation*, 1(2), 2011, 99-104.
12. Sonawane SH, Patil VV, Thakare VM, Tekade BW, Patil VR. Formulation and Evaluaion of Famotidine Fast Dissolving Oral Film. *World Journal of Pharmaceutical research*, 1(4), 2012, 1084-95.
13. Ms. Mital S. Panchal, Mr. Hiren Patel, Mrs. Aarti Bagada, Dr.Vadalia K.R. Formulation and Evaluation of Mouth Dissolving Film of Ropinirole Hydrochloride by Using Pullulan Polymers. *International Journal of Pharmaceutical Research & Allied Sciences*, 1(3), 2012, 60-72.
14. Pandit Mihir, Gandhi Nirvi, Bonde Smita, Pandya Sudhir. Formulation Development and Evaluation of Quick Dissolving Oral Strips Containing Sumatriptan Succinate. *International Research Journal of Pharmacy*, 3(11), 2012, 216-19.
15. Prasanna Desu, Manoranjan Sahu. Formulation and Evaluation of fast Dissolving Films of Zolmitriptan. *International Research Journal of Pharmacy*, 3(5), 2012, 373-376.
16. MohemmedTahir M Shaikh, Atul A Gore, Kishor S Salunkhe, Sanjay R Chaudhari. Formulation Development & Evaluation of Fast Dissolving Oral Film of Amlodipine Besilate by Solvent Casting Technique. *International Journal of Universal Pharmacy and Bio Sciences*, 2(3), 2013, 534-544.