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Formulation development and evaluation of fast disintegrating tablet of lornoxicam by using co-processed super disintegrants

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Abstract
The concept of fast dissolving drug delivery system emerged from the desire to provide patient with more convenient means of taking their medication. It is difficult for many patients to swallow tablets and hard gelatin capsules. The main objective of the study is to develop reproducible formulation of fast dissolving tablets of Lornoxicam already used therapeutic molecule to enhance effectiveness, and to avoid side effects (gastric irritation) of the drug. Different batches of tablets were prepared by direct compression method using different concentration of superdisintegrants like Cross povidone, Cross carmellose sodium, Sodium starch glycollate. Superdisintegrants were used by three means i.e. by direct addition of superdisintegrants, by using physical mixture of superdisintegrants and by using co-processed mixture of superdisintegrants. In this study total four formulations were formulated by direct addition of superdisintegrants, eighteen formulations were formulated by addition of physical mixture of superdisintegrants in different ratios and eighteen formulations were formulated by addition of co-processed mixture of superdisintegrants in different ratios.
Before compression preformulation studies were done which includes characterization of blend and physical compatibility studies with excipients. Effect of change in superdisintegrant and their concentration on the formulation was studied. Final batches were compared for superiority of superdisintegrants in the formulation of FDT of Lornoxicam.

Keywords: Lornoxicam, superdisintegrants, cross povidone direct compression etc.

Introduction
The fast dissolving tablets are good choice in the case of motion sickness and sudden episodes of coughing during the common cold, allergic condition and bronchitis. United States Food and Drug Administration (FDA) defined ODT as "A solid dosage form containing medicinal substance or active ingredient which disintegrates rapidly usually within a matter of seconds when placed upon the tongue." The disintegration time for ODTs generally ranges from several seconds to about a minute.
Lornoxicam is a NSAID drugs belongs to the oxicam class as with other NSAIDS Lornoxicam is a potent inhibitor of the cyclooxygenase enzyme, which are responsible for the catalyzing the formation of prostaglandins and thromboxane from arachidonic acid. Like all NSAIDs, it acts by inhibiting the metabolites of COX branch of arachidonic acid pathway. It inhibits both isoforms in the same concentration range i.e. COX-1/COX-2 = 1. Thus, a perfectly balanced inhibition of COX-1 and COX-2 is achieved. COX-1 is a constitutive enzyme expressed in many cells as a house keeping enzyme and provides homeostatic prostaglandins. COX-2 is an inducible enzyme, which is expressed at the onset of inflammation in many cell types involved in inflammatory responses. It differs from other oxicam compounds in its potent inhibition of prostaglandin biosynthesis, a property that explains the particularly pronounced efficacy of the drug. Prostaglandins are involved in all phases of inflammatory events including fever, pain reactions and physiological functions like intestinal motility, vascular tone, renal function, gastric acid secretion etc. The IUPAC name of Lornoxicam is (3E)-6-chloro-3-[hydroxy(pyridin-2-ylamino)methylene]-2-methyl-2,3-dihydro-4Hthieno[2,3-e][1,2]thiazin-4-one-1,1-dioxide. The molecular formula is $C_{13}H_{10}ClN_3O_4S_2$ and molecular weight is 371.8192g/mol. It is a crystalline drug having faint yellow to dark yellow color. The melting point of the drug is 225 C to 230 C. it is poorly soluble in water and soluble in 0.1 N NaOH solutions. The structural formula of the drug is given below.

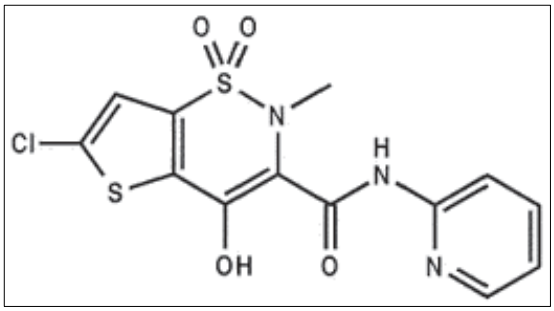

Fig 1: Chemical Structure of Lornoxicam

Materials and Methods

Lornoxicam was gifted from Optimus drugs Pvt. Ltd. Sodium Starch Glycolate, Crospovidone and Avicel PH 102 were purchased from Signet Chemicals Pvt. Ltd., Mumbai. Dibasic Calcium Phosphate, Dextrose, Magnesium Stearate and Talc were purchased from Central Drug House (P) Ltd., Mumbai. All chemicals were optimum grades.

Preparation of Drug Free Tablets

Drug free fast disintegrating tablets were prepared by direct compression method using single punch tablet machine. The formulations were developed by using three techniques in various ratios by adding

- Superdisintegrants
- Physical mixture of superdisintegrants
- Co-processed mixture of superdisintegrants.

Addition of Super Disintegrants

The super disintegrants, crospovidone and Cross-cramilose in varying concentration (5 % and 10 %) were used to develop the tablets. All the ingredients were weighed accurately using a digital balance. Excess was calculated so as to accommodate the loss during the whole process of manufacturing. All the ingredients (except talc and magnesium stearate) were passed through mesh no. 60 and were co-ground in a glass pestle mortar. Finally Talc and magnesium stearate were added and mixed for 5 minutes. The mixed blend of excipients was compressed using a single punch tablet machine to produce convex faced tablets weighing 150 mg each with 7.3 mm diameter. A minimum 50 tablets of each formulation were prepared.

Table 1: Formulation of drug-free fast disintegrating tablets (F_1-F_4)

Materials (mg)	Batch Code			
	F_1	F_2	F_3	F_4
Dibasic Calcium Phosphate	36	36	36	36
Dextrose	25	25	25	25
Talc	3	3	3	3
Magnesium Stearate	3	3	3	3
Avicel PH 102	75.5	68	75.5	68
Crospovidone	7.5	15	-	-
Sodium starch glycolate	-	-	7.5	15

Addition of Physical Mixture of Super Disintegrants

Physical mixtures of sodium starch cross povidone and cross-cramilose were prepared in different ratios by co-grounding with the help of mortar and pestle. Both the superdisintegrants were accurately weighed on digital balance and co-ground properly to get the physical mixture of superdisintegrants.

Table 2: Formulation of physical mixture of superdisintegrants

Formulation Code	Cross Povidone	Cross-Carmilose
PM1	1	1
PM2	2	1
PM3	3	1
PM4	4	1
PM5	5	1
PM6	1	2
PM7	1	3
PM8	1	4
PM9	1	5

Drug free fast disintegrating tablets were prepared by using physical mixture of superdisintegrants in varying concentrations (5 % and 10 %). All the ingredients were weighed accurately using a digital balance. Excess was calculated so as to accommodate the loss during the whole process of manufacturing. All the ingredients (except talc and magnesium stearate) were passed through mesh no. 60 and were co-ground in a glass pestle motor. Finally Talc and magnesium stearate were added and mixed for 5 minutes. The mixed blend of excipients was compressed using a single punch tablet machine to produce convex faced tablets weighing 150 mg each with -7.3 mm diameter. A minimum 50 tablets of each formulation were prepared.

Table 3: Formulation of drug-free fast dissolving tablets (F5-F10)

Materials (mg)	Batch Code					
	F_5	f_6	f_7	F_8	f_9	F_{10}
Dextrose	25	25	25	25	25	25
Talc	3	3	3	3	3	3
Magnesium Stearate	3	3	3	3	3	3
Avicel PH 102	111.5	104	111.5	104	111.5	104
PM1	7.5	15	-	-	-	-
PM2	-	-	7.5	15	-	-
PM3	-	-	-	-	7.5	15

Table 4: Formulation of drug-free fast dissolving tablets using physical mixture of superdisintegrants (F_{11}-F_{16})

Materials (mg)	Batch Code					
	F_{11}	F_{12}	F_{13}	F_{14}	F_{15}	F_{16}
Dibasic Calcium Phosphate	36	36	36	36	36	36
Dextrose	25	25	25	25	25	25
Talc	3	3	3	3	3	3
Magnesium Stearate	3	3	3	3	3	3
Avicel PH 102	75.5	87	75.5	68	75.5	68
PM4	7.5 -	15	-	-	-	-
PM5	-	-	7.5	15	-	-
PM6	-	-	-	-	7.5	15

Table 5: Formulation of drug-free fast dissolving tablets using physical mixture of superdisintegrants (F_{17}-F_{22})

Materials (mg)	Batch Code					
	F_{17}	F_{18}	F_{19}	F_{20}	F_{21}	F_{22}
Dibasic Calcium Phosphate	36	36	36	36	36	36
Dextrose	25	25	25	25	25	25
Talc	3	3	3	3	3	3
Magnesium Stearate	3	3	3	3	3	3
Avicel PH 102	75.5	68	75.5	68	75.5	68
PM7	7.5	15	-	-	-	-
PM8	-	-	7.5	15	-	-
PM9	-	-	-	-	7.5	15

Addition of Co-processed Mixture of Super Disintegrants

Preparation of Co-Processed Mixtures of Superdisintegrants: Various blends cross povidone and Cross-carmilose having total weight of 10 g were prepared in different ratios and was added to 65 ml of isopropyl alcohol. The contents of the beaker (250 ml capacity) were stirred on a magnetic stirrer. The temperature was maintained between 65°C and 70°C, and stirring was continued till most of isopropyl alcohol evaporated. The wet coherent mass was granulated through 60-mesh sieve. The wet granules were dried in a tray dryer at 60 °C for 20 min. The dried granules were sifted on 60-mesh sieve and stored in airtight container till further use.

Drug free fast disintegrating tablets were prepared by using co-processed mixture of superdisintegrants in varying concentration (2.5 and 5 %). All the ingredients were weighed accurately using a digital balance. Excess was calculated so as to accommodate the loss during the whole process of manufacturing. All the ingredients (except talc and magnesium stearate) were passed through mesh no. 60 and were co-ground in a glass pestle motor. Finally Talc and magnesium stearate were added and mixed for 5 min. The mixed blend of excipients was compressed using a single punch tablet machine to produce convex faced tablets weighing 150 mg each with 7.3 mm diameter. A minimum 50 tablets of each formulation were prepared.

Table 6: Formulation of co-processed mixture of superdisintegrants

Formulation Code	Crospovidone	Cross-cramilose
CPI	1	1
CP2	2	1
CP3	3	1
CP4	4	1
CP5	5	1
CP6	1	2
CP7	1	3
CP8	1	4
CP9	1	5

Table 7: Formulation of drug-free fast dissolving tablets using co-processed mixture of superdisintegrants (F_{23}-F_{28})

Materials (mg)	Batch Code					
	F_{23}	F_{24}	F_{25}	f_{26}	F_{27}	F_{28}
Dibasic Calcium Phosphate	36	36	36	36	36	36
Dextrose	25	25	25	25	25	25
Talc	3	3	3	3	3	3
Magnesium Stearate	3	3	3	3	3	3
Avicel PH 102	75.5	68	75.5	68	75.5	68
CPI	7.5	15				
CP2			7.5	15		
CP3					7.5	15

Table 8: Formulation of drug-free fast dissolving tablets using co-processed mixture of superdisintegrants (F_{29}-F_{34})

Materials (mg)	Batch Code					
	F_{29}	F_{30}	F_{31}	F_{32}	F_{33}	F_{34}
Dibasic Calcium Phosphate	36	36	36	36	36	36
Dextrose	25	25	25	25	25	25
Talc	3	3	3	3	3	3
Magnesium Stearate	3	3	3	3	3	3
Avicel PH 102	75.5	68	75.5	68	75.5	68
CP4	7.5	15	-	-	-	-
CP5	-	-	7.5	15	-	-
CP6	-	-	-	-	7.5	15

Table 9: Formulation of drug-free fast dissolving tablets using co-processed mixture of superdisintegrants (F_{35}-F_{40})

Materials (mg)	Batch Code					
	F_{35}	F_{36}	F_{37}	F_{38}	F_{39}	F_{40}
Dibasic Calcium Phosphate	36	36	36	36	36	36
Dextrose	25	25	25	25	25	25
Talc	3	3	3	3	3	3
Magnesium Stearate	3	3	3	3	3	3
Avicel PH 102	75.5	68	75.5	68	75.5	68
CP7	7.5	15	-	-	-	-
CP8	-		7.5	15	-	-
CP9	-	-		-	7.5	15

Result and discussion

Table 10: Characterization of Blends (F_1-F_{20})

Formulation	Bulk Density (g/cm^3)	Tapped Density (g/cm^3)	Carr's Index (%)	Hausner's Ratio	Angle of Repose
F_1	0.585±0.003	0.667±0.002	12.26±2.18	1.140±0.17	25.374±1.28
f_2	0.584±0.002	0.645±0.004	09.66±1.92	1.105±0.52	23.564±0.51
f_3	0.671±0.002	0.755±0.014	11.02±1.56	1.126±0.29	22.904±0.70
f_4	0.585±0.003	0.726±0.013	18.62±1.56	1.130±1.01	22.474±0.61
F_s	0.656±0.002	0.755±0.014	13.25±0.64	1.14±0.003	24.294±0.91
f_6	0.616±0.002	0.736±0.005	13.26±2.42	1.193±0.2	23.215±1.03
F_7	0.685±0.004	0.760±0.010	10.12±0.86	1.117±0.32	23.474±0.48
f_8	0.641±0.008	0.738+0.010	13.39 ±2.38	1.141±0.65	24.324±1.11
f_9	0.603±0.005	0.782±0.014	22.39±2.05	1.127±0.10	23.154±1.32
F_{10}	0.677±0.008	0.755±0.014	10.29±0.86	1.114±0.04	21.884±0.58
F_{11}	0.656±0.012	0.779±0.002	17.80±2.29	1.18±0.008	21.658±0.58
F_{l2}	0.616±0.003	0.760±0.0016	17.79±2.41	1.121±0.12	22.567±0.93
F_{13}	0.653±0.002	0.764±0.059	14.65±2.29	1.15±0.007	23.904±0.43
F_{14}	0.687±0.0009	0.785±0.005	12.51±0.62	1.132±0.005	24.044±0.25
F_{15}	0.671±0.015	0.736±0.003	08.69±2.53	1.20±0.009	21.890±0.44
F_{16}	0.679±0.004	0.751±0.002	8.95±1.08	1.121±0.006	23.347±0.95
F_{17}	0.655±0.002	0.716±0.005	8.58±1.28	1.095±0.006	22.4034±0.82
F_{18}	0.622±0.002	0.713±0.014	12.68±0.74	1.131±0.011	22.737±1.64
F_{19}	0.649±0.003	0.755±0.014	14.02±2.42	1.140±0.004	21.607±0.64
F_{20}	0.656±0.012	0.728±0.028	09.79±2.24	1.160±0.004	22.251±1.65

Data are expressed as mean ± S.D. (n = 3)

Table 11: Cauterization of Blends (F_{21} – F_{40})

Formulation	Bulk Density (g/cm^3)	Tapped Density (g/cm^3)	Carr's Index (%)	Hausner's Ratio	Angle of Repose
F_{21}	0.659±0.002	0.768±0.002	14.23±0.42	1.168±0.001	21.256±1.65
F_{22}	0.644±0.012	0.730±0.015	11.69±1.79	1.371±0.003	21.921±0.50
F_{23}	0.658±0.003	0.740±0.010	11.07±2.32	1.121±0.011	24.487±1.38
F_{24}	0.583±0.002	0.682±0.050	14.48±1.89	1.168±0.002	24.226±1.24
f_{25}	0.657±0.003	0.741±0.008	11.29±1.26	1.125±0.21	23.123±0.22
F_{26}	0.636±0.048	0.727±0.002	12.49±1.31	1.141±0.056	24.457±0.03
F_{27}	0.670±0.001	0.762 ±0.004	12.02±1.39	1.132±0.006	22.355±1.64
F_{28}	0.685±0.004	0.768±0.002	10.73±1.16	1.120±0.004	21.241 ±0.99
F_{29}	0.651±0.002	0.713±0.002	08.63±1.38	1.063±0.044	22.224±1.14
F_{30}	0.627±0.002	0.708±0.001	11.38±1.29	1.12±0.006	22.957±1.23
F_{31}	0.649±0.013	0.730±0.010	11.07±2.64	1.124±0.004	21.767±1.70
F_{32}	0.608±0.015	0.689±0.006	11.57±2.82	1.133±0.01	24.698±0.78
F_{33}	0.656±0.017	0.717±0.009	8.49±2.66	1.098±0.010	22.422±1.04
F_{34}	0.599±0.011	0.673±0.022	10.97±2.58	1.115±0.004	23.596±0.34
F_{35}	0.680±0.014	0.761±0.010	10.58±2.49	1.11±0.009	25.379±0.35
F_{36}	0.653±0.003	0.735±0.007	10.89±1.32	1.124±0.018	25.845±0.68
F_{37}	0.636±0.012	0.713±0.009	10.77±2.38	1.112±0.010	23.400±0.045
F_{38}	0.620±0.008	0.740±0.012	16.03±1.95	1.192±0.030	24.952±0.008
F_{39}	0.656±0.010	0.734±0.011	10.55±1.83	1.118±0.031	26.385±0.09
F_{40}	0.649±0.013	0.730±0.015	10.89±1.49	1.125±0.003	25.503±0.075

Data are expressed as mean ± S.D. (n = 3)

Table 12: Evaluation of Drug Free Fast Dissolving Tablets (F_1-F_{20})

Formulation	Thickness (mm)	Diameter (mm)	Weight (mg)	Hardness (kg/cm^2)
F_1	3.192±0.05	7.394±0.023	150.3±1.072	4.1±0.103
F_2	3.165±0.012	7.399±0.014	151.2±1.178	4.3±0.352
F_3	3.270±0.029	7.401±0.005	149.6±2.349	4.0±0.198
F_4	3.298±0.023	7.398±0.006	149.6±1.435	4.4±0.296
F_s	3.263±0.065	7.396±0.045	151.6±3.156	4.4±0.189
F_6	3.150±0.029	7.397±0.013	152.3±1.531	3.9±0.256
F_7	3.270±0.057	7.396±0.005	149.8±0.336	4.5±0.153
F_8	3.201±0.012	7.394±0.011	150.8±1.896	4.3±0.351
F_9	3.270±0.064	7.393±0.014	151.2±1.123	4.4±0.265
F_{10}	3.171±0.006	7.397±0.016	152.2±1.204	4.3±0.296
F_{11}	3.280±0.016	7.388±0.006	151.4±0.453	4.4±0.194
F_{12}	3.280±0.018	7.398±0.009	150.5±1.165	4.1±0.154
F_{13}	3.292±0.015	7.389±0.015	151.3±1.586	4.2±0.302
F_{14}	3.178±0.038	7.402±0.009	152.6±1.685	4.4±0.169
F_{15}	3.315±0.008	7.386±0.004	149.8±1.470	4.5±0.392
F_{16}	3.295±0.047	7.391±0.007	151.6±1.856	4.3±0.198
F_{17}	3.284±0.007	7.385±0.011	150.1±0.984	4.0±0.368
F_{18}	3.254±0.32	7.392±0.006	150.0±1.987	4.1±0.254
F_{19}	3.160±0.004	7.389±0.002	153.1±0.871	4.3±0.198
F_{20}	3.200±0.005	7.393±0.004	149.5±1.497	4.4±0.352

Data are expressed as mean ± S.D. (n = 3)

Table 13: Evaluation of Drug Free Fast Dissolving Tablets (F_{21}-F_{40})

Formulation	Thickness (mm)	Diameter (mm)	Weight (mg)	Hardness (kg/cm^2)
F_{21}	3.260±0.015	7.398±0.011	154.1±1.965	4.5±0.109
F_{22}	3.281±0.014	7.394±0.007	151.2±1.698	4.1±0.146
F_{23}	3.324±0.041	7.391±0.005	149.9±1.589	4.4±0.242
F_{24}	3.310±0.006	7.388±0.008	150.9±2.104	4.3±0.246
F_{25}	3.241±0.045	7.384±0.006	151.3±1.259	4.3±0.314
F_{26}	3.346±0.031	7.387±0.008	150.3±1.569	4.5±0.198
F_{27}	3.241±0.040	7.391±0.012	151.5±0.892	4.2±0.214
F_{28}	3.194±0.025	7.397±0.008	149.9±0.998	4.3±0.256
F_{29}	3.261±0.022	7.395±0.007	151.3±2.156	4.3±0.369
F_{30}	3.341±0.024	7.394±0.009	150.8±1.685	4.3±0.231
F_{31}	3.293±0.042	7.398±0.015	150.3±2.150	4.3±1.195
F_{32}	3.226±0.022	7.397±0.006	150.5±2.308	4.2±0.214
F_{33}	3.223±0.023	7.395±0.012	150.7±0.892	4.3±0.142
F_{34}	3.255±0.019	7.397±0.015	151.1±1.784	4.4±0.187
F_{35}	3.335±0.008	7.396±0.009	149.2±1.982	4.2±0.280
F_{36}	3.337±0.008	7.392±0.004	150.9±1.674	4.3±0.325
F_{37}	3.324±0.012	7.391±0.006	150.3±1.652	4.2±0.254

F_{38}	3.292±0.041	7.399±0.005	149.3±2.582	4.3±0.148
F_{39}	3.264±0.017	7.395±0.011	149.6±0.368	4.4±0.178
F_{40}	3.291±0.019	7.397±0.013	150.1±0.892	4.3±0.208

Data are expressed as mean ± S.D. (n = 3)

Table 14: Evaluation of Drug Free Fast Dissolving Tablets (F_1-F_{20})

Formulation	Friability (%)	Disintegration Time (s)	Wetting Time (s)	Dispersion Time (s)
F_1	0.579±0.013	143.25±1.08	122.62±1.21	175.89±1.98
f_2	0.714±0.037	126.25±0.95	110.99±1.56	155.89±2.89
f_3	0.720±0.042	129.55±2.11	117.56±0.72	156.29±3.21
f_4	0.692±0.006	116.18±1.05	102.71±1.90	139.82±2.89
f_5	0.576±0.017	124.23±3.24	104.69±1.52	149.84±2.96
f_6	0.429±0.006	108.65±1.55	99.52±0.58	129.83±1.49
f_7	0.413±0.011	114.00±2.14	96.89±1.56	139.85±2.89
f_8	0.483±0.003	96.58±1.49	89.56±0.88	119.83±1.95
f_9	0.324±0.013	104.58±1.75	99.85±0.91	129.39±1.78
F_{10}	0.414±0.014	82.69±1.54	78.55±0.87	101.62±1.29
F_{11}	0.380±0.005	98.95±2.15	76.81±1.67	109.81±1.49
F_{12}	0.656±0.004	85.65±2.94	75.19±1.54	89.81±1.81
F_{13}	0.756±0.029	98.25±0.85	78.59±1.52	98.39±1.59
F_{14}	0.554±0.038	68.34±1.69	59.25±1.96	79.58±1.74
F_{15}	0.289±0.041	98.68±1.68	99.85±1.51	129.83±0.89
F_{16}	0.394±0.028	98.65±1.36	89.36±1.98	109.85±1.56
F_{17}	0.475±0.037	93.56±1.68	81.89±2.28	118.55±0.83
F_{18}	0.545±0.039	78.69±2.45	65.86±2.87	99.858±0.91
F_{19}	0.598±0.034	86.27±3.61	79.26±1.95	98.69±3.59
F_{20}	0.721±0.016	59.55±0.63	59.58±1.51	88.98±1.39

Data are expressed as mean ± S.D. (n = 3)

Table 15: Evaluation of Drug Free Fast Dissolving Tablets (F_{21}-F_{40})

Formulation	Friability (%)	Disintegration Time (s)	Wetting Time (s)	Dispersion Time (s)
F_{21}	0.898±0.010	72.20±1.39	65.88±3.56	86.93±2.89
F_{22}	0.639±0.059	59.98±l.06	56.89±1.89	69.85±l.89
F_{23}	0.345±0.014	104.72±0.61	89.59±l.48	82.45±l.81
F_{24}	0.421±0.028	86.58±1.69	56.98±l.14	91.76±2.76
F_{25}	0.484±0.018	89.62±1.52	66.15±l.46	85.89±l.58
F_{26}	0.475±0.042	71.56±1.56	48.93±l.58	98.25±3.25
F_{27}	0.486±0.034	83.45±0.97	66.85±l.69	69.78 ±l.29
F_{28}	0.536±0.029	56.89±2.26	48.90±l.35	70.52±l.68
F_{29}	0.614±0.054	69.55±1.35	59.85±3.59	79.83±2.59
F_{30}	0.715±0.016	36.56±2.63	32.98±2.89	42.97±l.82
F_{31}	0.706±0.019	48.25±1.45	36.88±1.89	59.86±3.59
F_{32}	0.719±0.023	39.56±1.98	23.18±2.42	41.64±l.32
F_{33}	0.362±0.039	83.22±l.41	78.69±2.45	65.79±l.38
F_{34}	0.526±0.048	53.65±1.26	61.62±2.51	69.82±2.89
f_{35}	0.389±0.017	72.65±2.45	69.59±l.84	89.25±0.95
F_{36}	0.491±0.035	40.56±l.09	39.58±l.61	49.83±l.46
F_{37}	0.395±0.029	56.51±1.24	48.56±2.97	68.29±2.83
F_{38}	0.589±0.026	34.95±0.86	19.98±l.89	38.75±2.95
F_{39}	0.895±0.057	38.26±l.26	35.89±2.09	39.78±0.59
F_{40}	0.659±0.058	18.29±2.82	11.56±l.80	32.58±l.09

Data are expressed as mean ± S.D. (n = 3)

Formulation of fast dissolving tablets of lornoxicam

The critical parameters to formulate a fast dissolving tablet are a choice of superdisintegrants and optimization of concentration of superdisintegrants. The main criteria for fast disintegrating tablets are to disintegrate or dissolve rapidly in oral cavity in 1 min, without the need of water and should have pleasant mouth feel. The fast disintegrating tablets of Lornoxicam were prepared by three technologies in different ratios as described earlier. On the basis of characterization of drug free tablets, the best formulations were selected (F_{10}, F_{14}, F_{20}, F_{30}, F_{32}, F_{39}) and the drug; Lornoxicam was incorporated in these formulations. The ingredients depicted in Table 16-17 (except talc and magnesium stearate) were mixed homogenously and co-ground in a mortar and pestle. Finally talc and magnesium stearate were added and mixed for 5 min. The mixed blends of Lornoxicam and other excipients were compressed using a single punch machine to produce convex faced tablets, weighing 150 mg each with diameter 7.3 mm.

Table 16: Formulation of lornoxicam fast dissolving tablets

Materials (mg)	Batch Code					
	F_{10}	F_{14}	F_{20}	F_{30}	F_{32}	F_{39}
Lornoxicam	4	4	4	4	4	4
Dibasic Calcium Phosphate	36	36	36	36	36	36
Dextrose	25	25	25	25	25	25
Talc	3	3	3	3	3	3
Magnesium Stearate	3	3	3	3	3	3
Avicel PH 102	64	64	64	64	64	71.5
PM3	15	-	-	-	-	-
PM5	-	15		-	-	-
PM8	-	-	15	-	-	-
CP4	-	-	-	15	-	-
CP5	-	-	-		15	-
CP9	-	-	-		-	7.5

Table 17: Characterization of Blends

Formulation	Bulk Density (g/cm^3)	Tapped Density (g/cm^3)	Carr's Index (%)	Hausner's Ratio	Angle of Repose
F_{10}	0.687±0.008	0.775±0.017	10.99±0.86	1.134±0.14	21.879±0.51
F_{14}	0.682±0.019	0.768±0.015	11.21±0.72	1.129±0.025	24.044±0.25
F_{20}	0.661±0.012	0.738±0.028	10.39±2.14	1.169±0.004	22.151±1.75
F_{30}	0.642±0.002	0.699±0.005	08.25±1.29	1.07±0.011	22.827±1.33
F_{32}	0.638±0.014	0.695±0.008	08.24±2.62	1.10±0.012	23.605±0.68
f_{39}	0.656±0.011	0.739±0.015	11.19±1.43	1.128±0.026	21.554±0.06

Data are expressed as mean ± S.D. (n = 3)

Table 18: Evaluation of Fast Dissolving Tablets of Lornoxicam

Formulation	Thickness (mm)	Diameter (mm)	Weight (mg)	Hardness (kg/cm^2)
F_{10}	3.171±0.006	7.397±0.016	152.2±1.204	4.3±0.296
F_{14}	3.178±0.038	7.380±0.006	152.6±1.685	4.4±0.169
F_{20}	3.20±0.005	7.363±0005	149.5±1.497	4.4±0.352
F_{30}	3.341±0.024	7.301±0.008	150.8±1.685	4.3±0.231
F_{32}	3.226±0.022	7.387±0.005	150.5±2.308	4.2±0.214
F_{39}	3.264±0.017	7.385±0.010	149.6±0.368	4.4±0.178

Data are expressed as mean ± S.D. (n = 3)

Table 19: Evaluation of Fast Dissolving Tablets of Lornoxicam

Formulation	Friability (%)	Disintegration Time (Sec)	Wetting Time (Seconds)	Dispersion Time (Sec)
F_{10}	0.481±0.009	81.39±1.34	79.65±0.82	100.12±1.39
F_{14}	0.561±0.037	70.46±1.19	58.45±1.81	79.85±1.44
F_{20}	0.684±0.024	62.45±0.43	58.65±1.31	85.55±1.21
F_{30}	0.713±0.029	33.62±2.26	28.56±2.23	44.65±l.52
F_{32}	0.719±0.023	34.60±1.48	25.25±2.05	42.61±l.24
F_{39}	0.786±0.047	36.26±l.48	36.74±2.19	39.56±0.79

Data are expressed as mean + S.D. (n = 3)

Content Uniformity

Ten randomly selected tablets were weighed and average weight was calculated, the tablets were powdered in a glass mortar pestle. The weight equivalent to 04 mg Lornoxicam was weighed. The weighed amount was dissolved in 5 ml of methanol in separate volumetric flask using magnetic stirrer, the volume was adjusted to 100 ml, with Phosphate buffer (pH 6.8) and the solution was filtered. An aliquot of 1.0 ml from these solution were diluted to 10 ml Phosphate buffer (pH 6.8) in separate volumetric flask. The content in each formulation was determined spectrophotometrically at 379 nm. The results were shown in Table 20.

Table 20: Drug Content in the Fast Dissolving Tablets of Lornoxicam

Formulation Code	Drug Content (mg per tablet)	Drug Content (%)
F_{10}	04.03	100.7
F_{14}	03.89	97.25
F_{20}	03.92	98.00
F_{30}	03.94	98.50
F_{32}	03.97	99.25
F_{39}	03.93	98.78

Conclusion

In the present study, fast dissolving tablets of Lornoxicam were formulated by using direct compression employing the use of superdisintegrants to achieve the rapid dissolving property and enhanced bioavailability. The absorption maxima of was observed at 379 nm, which is concordant with

values given in FTIR Spectra of Drug. The tablets were evaluated for their organoleptic (Color, Odor, Taste), physical (Size, Shape and Texture) and quality control parameters (Diameter, Thickness, Hardness, Friability, Disintegration Time and Wetting Time). Based on these parameters, the co-processed superdisintegrant proved to be superior to the physical blend in terms of flow due to size enlargement. Furthermore, the co-processed superdisintegrant displayed superiority in terms of crushing strength, disintegration time, and drug dissolution. The advantages of the proposed method are easy adaptability in industry and the possibility of by passing the existing patents in the areas of quick disintegration and dissolution.

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