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Formulation and Evaluation of Floating Drug Delivery System for Arthritis Using Nsaid

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ABSTRACT
Lornoxicam is one of the drugs used for the management of arthritic pain. The site of absorption of Lornoxicam is in the GIT and it has a short half-life of 3-4 h. Therefore, the present investigation was concerned with the development of the floating matrix tablets, which after oral administration are designed to prolong the gastric residence time and thus, improve the bioavailability of the drug as well as its half-life. Lornoxicam showed maximum absorption at wavelength at 374 nm in 0.1 N HCl. Drug-Polymer compatibility studies by FTIR gave conformation about their purity and showed no interaction between drug and selected polymers. Various formulations were developed by using release rate controlling gel forming polymers like HPMC (K-4 M, K-15 M & K-100 M) in a single by direct compression method with the incorporation of $NaHCO_3$ as a gas generating agent. All the formulation had floating lag time below 55 seconds and constantly floated on dissolution medium for more than 24 hours. Swelling studies indicated significant water uptake and contributed in drug release. From among all the developed formulations, as formulation F-3 prolonged the drug release for longer period of time and it had less floating lag time as compared to other formulations. So, it was selected as the best formulation. It was concluded that the drug release followed Zero order kinetics, as the correlation coefficient (R^2 value) was higher for Zero order release, so the drug release followed controlled release mechanism. The best formulation was found to be stable during the stability studies for two months. Thus, the best formulation satisfied physicochemical parameters, floating properties, swelling index and in vitro drug release profile requirements for a floating drug deliverysystem.

Key words: Lornoxicam; floating drug delivery system; Floating matrix tablet; HPMC.

RESULTS

PREFORMULATION STUDIES

DEVELOPMENT OF STANDERD CALIBRATION CURVE

Table : Standard calibration curve of Lornoxicam in simulated gastric fluid

Sr. No.	Concentration(µg/ml)	Absorbance
1	0	0
2	3	0.178 ± 0.005
3	6	0.345 ± 0.0097
4	9	0.509 ± 0.013
5	12	0.691 ± 0.009

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6	15	0.861± 0.017
7	18	0.997±0.026

STANDARD CALIBRATION CURVE OF LORNOXICAM

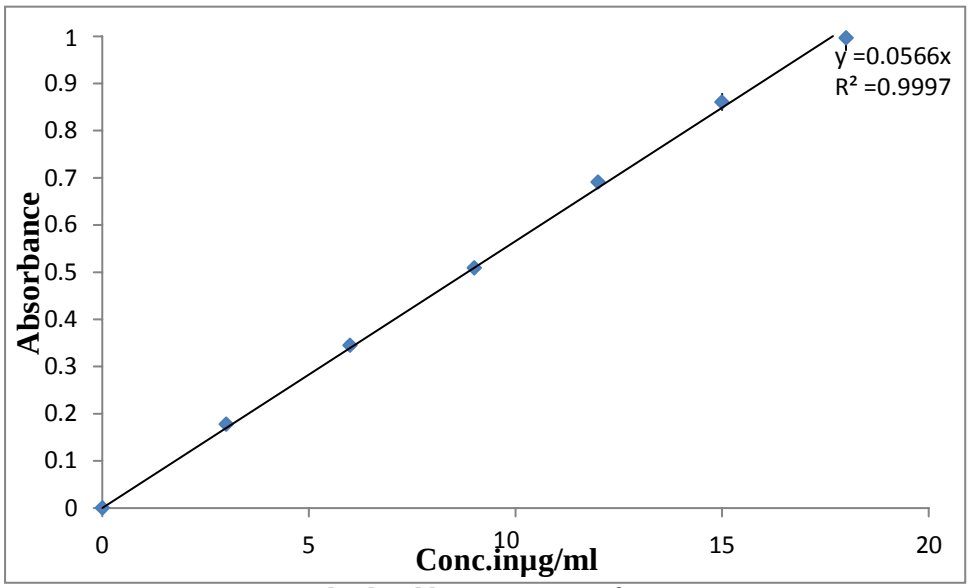

Figure 6: Standard Calibration Curve of Lornoxicam

FT-IR of pure drug and polymer mixture

Table : Characteristic peaks of lornoxicam in FT-IR spectra in cm^{-1}

Pure drug	**Pure drug + HPMC K-4M**	**Pure drug + HPMC K-15M**	**Pure drug + HPMC K-100M**	**Description**
3061	3062	3062	3063	-NH stretch
1636	1636	1636	1637	Primary amide (CONH) present
1592, 1534	1592, 1535	1593, 1534	1593, 1535	Secondary amide present

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1143, 1323, 1377	1142, 1324, 1377	1142, 1323, 1377	1142, 1324, 1378	R-SO_2-R present
829	830	829	830	C-H Aromatic ring bending
785	786	785	786	C-X present

Table: Formulation chart of developed floating matrix tablets

Formulation code	Ingredients							
	Lornoxicam (mg)	HPMC K-4M (mg)	HPMC K-15M (mg)	HPMC K-100M (mg)	$NaHCO_3$(mg)	MCC (mg)	Magnesium stearate (mg)	Talc (mg)
F-1	8	8	-	-	50	79	2.5	2.5
F-2	8	16	-	-	50	71	2.5	2.5
F-3	8	24	-	-	50	63	2.5	2.5
F-4	8	32	-	-	45	60	2.5	2.5
F-5	8	40	-	-	45	52	2.5	2.5
F-6	8	-	8	-	50	79	2.5	2.5
F-7	8	-	16	-	50	71	2.5	2.5
F-8	8	-	24	-	50	63	2.5	2.5
F-9	8	-	32	-	45	60	2.5	2.5
F-10	8	-	40	-	45	52	2.5	2.5

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F-11	8	-	-	8	50	79	2.5	2.5
F-12	8	-	-	16	50	71	2.5	2.5
F-13	8	-	-	24	50	63	2.5	2.5
F-14	8	-	-	32	45	60	2.5	2.5
F-15	8	-	-	40	45	52	2.5	2.5

Total weight of the tablet is 150 mg.

EVALUATION OF PREFORMULATION PARAMETERS

Table : Micromeritic properties of Lornoxicam floating matrix tablets

Formulation code	**Angle of repose* (º) ± S.D.**	**Bulk density* (gm/ml) ±S.D.**	**Tapped density* (gm/ml) ± S.D.**	**Carr's index* (%) ± S.D.**
F1	29.47±6.32	0.388±0.019	0.444±0.014	12.44±9.05
F2	29.24±5.1	0.348±0.028	0.395±0.021	11.72±6.21
F3	27.95±2.47	0.32±0.011	0.3938±0.023	15.5±1.55
F4	28.95±8.14	0.31±0.039	0.35±0.04	11.4±3.36
F5	30.47±4.89	0.324±0.013	0.373±0.014	13.06±5.51
F6	33.82±3.22	0.311±0.022	0.361±0.019	13.8±3.29
F7	34.24±5.35	0.352±0.051	0.399±0.028	11.78±4.28
F8	28.95±6.49	0.331±0.017	0.397±0.031	16.62±7.04
F9	32.9±1.05	0.352±0.023	0.3939±0.049	10.57±2.67

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F10	29.24±2.96	0.378±0.035	0.45±0.020	15.95±1.5
F-11	32.12±8.03	0.325±0.006	0.393±0.044	17.38±3.66
F-12	33.21±4.451	0.362±0.013	0.413±0.056	12.34±3.29
F-13	29.73±3.331	0.338±0.037	0.392±0.027	13.77±5.67
F-14	30.9±2.41	0.34±0.041	0.384±0.051	11.41±3.32
F-15	30.98±6.9	0.346±0.044	0.392±0.060	11.73±6.44

***Average of 3 determination ± standard deviation**

CONCLUSION

- Lornoxicam is one of the short half-lives oxicams, which is used for the management of different types of Arthritis. Moreover, the site of absorption of Lornoxicam is in the stomach. The half-life of Lornoxicam was found to be 3-4 h. therefore, the present investigation was concerned with the development of floating matrix tablets, which after oral administration were designed to prolong the gastric residence time and thus, it improves the bioavailability of the drug as well as itshalf-life.
- AsuitablemethodofanalysisofdrugbyUVspecto photometrywasdeveloped.

Lornoxicam showed maximum absorption at wavelength 374 nm in 0.1 N HCl. The value of correlation coefficient was found to be 0.999, which showed linear relationship between concentration and absorbance. Preformulation study for drug-polymer compatibility by FT-IR gave conformation about their purity and showed no interaction between drug and selected polymers.

- Various formulations were developed by using release rate controlling and gel forming polymers like HPMC (K-4M, K-15M, K-100M) separately by direct compression method with the incorporation of sodium bicarbonate as gas generatingagent.
- Developed floating matrix tablets possessed the required physicochemical parameters such as hardness, friability, weight variation, drug content, swelling index and floating properties. All the developed floating matrix tablets floated up to 12 to 24h.
- Swelling studies indicated significant water uptake and contributed in drug release and gastro-retention. The higher viscosity polymer had been seen to inhibit the initial burst release of Lornoxicam from the FDDS. From among the all the developed formulations, formulationF-3 prolonged the drugreleaseforlongerperiodoftimeofbeyond24h and

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