



Review Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Oral dispersible tablets: An over view

Haritwal Manish Kumar*, Kalyanwat Renu and Tiwari Ajay Kumar

School of Pharmaceutical Sciences, Jaipur National University, Jaipur

ABSTRACT

The need for delivering drugs to patients efficiently with minimum side effects has prompted pharmaceutical industries to be engaged in development of new drug delivery systems. Pediatric and geriatric patients find it difficult to swallow solid dosage forms like tablets. Oral dispersible tablet is solid unit dosage form. The objective of present investigation was to prepared oral dispersible tablet of Levocetirizine Dihydrochloride and Montelukast Sodium because it's active working patients who are busy or travelling, especially those who have no access to water. This review depicts the various aspects of ODT formulation, superdisintegrants and technologies developed for ODT, along with various drugs explored, evaluation tests and marketed formulations in this field. Oral Dispersible tablets are prepared they are required to be evaluated for various parameters.

Keywords: Levocetirizine Dihydrochloride, Montelukast Sodium, superdisintegrants, Dry Granulation Technique etc.

INTRODUCTION

Levocetirizine (as levocetirizine dihydrochloride) is a third-generation non-sedative antihistamine, developed from the second-generation antihistamine cetirizine. Chemically, levocetirizine is the active enantiomer of cetirizine. It is the *R*-enantiomer of the cetirizine racemate. Levocetirizine works by blocking histamine receptors. It does not prevent the actual release of histamine from mast cells, but prevents it binding to its receptors. This in turn prevents the release of other allergy chemicals and increased blood supply to the area, and provides relief from the typical symptoms of hay fever.[2],[3].

Montelukast selectively antagonizes leukotriene D₄ (LTD₄) at the cysteinyl leukotriene receptor, CysLT₁, in the human airway. Montelukast inhibits the actions of LTD₄ at the CysLT₁ receptor, preventing airway edema, smooth muscle contraction, and enhanced secretion of thick, viscous mucus. So Montelukast sodium is used in the treatment of asthma.

Montelukast is chemically belongs to leukotriene receptor antagonist (LTRA) used for the maintenance treatment of asthma and to relieve symptoms of seasonal allergies.^{1,2} It is usually administered orally in the form of tablets and oral granules etc. Montelukast is a CysLT₁ antagonist; it blocks the action of leukotriene D₄ (and secondary ligands LTC₄ and LTE₄) on the cysteinyl leukotriene receptor CysLT₁ in the lungs and bronchial tubes by binding to it. Montelukast is a once-daily leukotriene receptor antagonist, in asthma and allergic rhinitis in both adults and children. .[4],[5]

The tablet is the most widely used dosage form because of its convenience in terms of self administration, compactness, and ease in manufacturing. However, geriatric and pediatric patients experience difficulty in swallowing conventional tablets, which leads to poor patient compliance. To overcome this weakness, scientists have developed innovative drug delivery systems known as "Dispersible Tablets". Dispersible Tablets are also known as quick dissolves, fast melts, fast dissolving, fast disintegrating, rapid-dissolve, or orally dissolving tablets. Their characteristic advantages such as administration, anywhere, anytime lead to their suitability to geriatric and pediatric patients. They are also suitable for the mentally ill, the bedridden, and patients who do not have easy access to water. The benefits, in terms of patient compliance, rapid onset of action, increased bioavailability, and good stability. [2],[3], [5]

EXPERIMENTAL SECTION

1. List of Chemicals and Solvents

S. No.	Name	Supplier / Manufacturer
1	Levocetirizine dihydrochloride	Dagon pharmaceuticals pvt. Ltd, Vadodara, (Gujarat)
2	D-Mannitol	Central Drug House (P) Ltd., Mumbai
3	Montelukast Sodium	Ranbaxy Research Laboratories, Gurgaon
4	Magnesium Stearate	Central Drug House (P) Ltd., Mumbai
5	MCC P101	Theramax Laboratories, Ambala, india.
6	Primojel	(E. Merck, Mumbai)
7	Primellose	Metro chemical Pvt. Ltd, Solan (H.P.)
8	Aspartame	ZED pharmaceuticals Pvt. Ltd, Karnal

2. List of Instruments and Equipments

S. No.	Name	Supplier / Manufacturer
1	Melting Point Apparatus	Hasslab Instrument Ltd. China
2	Digital Weighing Balance	Gottingen, Germany)
3	Double beam UV Spectrophotometer	1700-Shimadzu, Japan
4	Tablet Punching Machine	Pharma tech international kolkata
5	Hardness Tester	Rockwell , kolhapur
6	Friability	Roche friability test apparatus
7	Disintegrator	Pharma tech international kolkata
8	Heating mantle	Rockwell , kolhapur
9	Magnetic stirrer	Sunbim, India

3. Preparation of Powder Blend for Compression

3.1 Preparation of Granules

Step 1: All the in-active excipients and drug were passed through mesh no. 45 individually. Then dried at 50°C for 4-5 min. So to assure that all the drug and excipients have to be used is dry in order to develop an optimized formulation through Dry Granulation Technique.

Step 2: All the drugs i.e. Levocetirizine dihydrochloride, and Montelukast Sodium along with Microcrystalline Cellulose (P101) were taken and mixed thoroughly. Then by using large mm die and punch the slugs of API + MCC p101 was formed and crushed in pestle and mortar to form granular material. Now to get fine granules the granular material passed through sieve no. 18. Finally the required size of granules was obtained

Step 3: In this step, the fine granules which were obtained again slugged using large mm die and punch because the desired hardness of tablets could not be achieved. So again it was slugged and grind in pestle and mortar and finally sieve through mesh no 18.

Step 4: In final step the excipients which were left first passed through sieve no. 18 and thoroughly mixed with granular material. Then this blend was further analyzed for its flow properties. [2],[7],[8].

3.2 Formulation of Tablet :

Dispersible tablets of Montelukast & Levocetirizine Hydrochloride was prepared by direct compression. The composition of formulation F-1 to F-9 are shown in table. For the formulation of Montelukast & Levocetirizine Hydrochloride. dispersible tablet by direct compression, all the other excipients according to the formula were

weighed accurately. Montelukast Sodium & Levocetirizine Hydrochloride. D-Mannitol MCC P101, Primojel, Primellose, aspartame are passed through sieve # 22.. All the above sieved ingredients were then mixed for 15 minutes. Magnesium stearate previously passed through sieve # 60 was then mixed with above blend for 5 minutes. The mixture(s) was then allowed to compress using 16 station rotary tablet compression machines with 16.0×8.0mm flat oval punches with tablet weight 500mg. .[13]

4. Evaluation of powder blend :

4.1 Bulk Density

$$\text{Bulk Density} = \frac{\text{Bulk mass}}{\text{Bulk volume}} \text{ [15]}$$

4.2. Tapped Density

$$f_{\text{at}} = M/V_t$$

4.3 Compressibility Index and Hausner Ratio

$$C = (\rho_t - \rho_b) / \rho_t \times 100$$

Where:

ρ_t - Tapped density

ρ_b - Untapped bulk density

$$\text{Hausner ratio} = \rho_t / \rho_b$$

Where:

ρ_t is tapped density

ρ_b is bulk density.

Hausner's ratio = (Tapped density x 100)/ (Poured density)

Hausner's ratio <1.25 – Good flow = 20% compressibility index

1.25– Poor flow =33% compressibility index

4.4 Angle of Repose

$$\Theta = \tan^{-1} h/r$$

Where,

Θ is the angle of repose

h is height of pile

r is radius of the base of pile

Table 1: Result of Powder Blend Evaluation

Parameters	Batch A1	Batch A2	Batch A3	Batch A4	Batch A5	Batch A6	Batch A7	Batch A8	Batch A9
Bulk density	0.694	0.701	0.710	0.662	0.713	0.697	0.777	0.723	0.747
Tapped Density (TD)	0.857	0.877	0.839	0.813	0.856	0.872	0.919	0.913	0.955
Angle of repose	29.2°	27.3°	28.5°	26.2°	28.1°	25.2°	24.9°	25.4°	24.3°
Carr's Compressibility index	19.25	20.06	16.57	19.68	19.41	16.70	20.06	20.78	14.37
Hausner Ratio	1.24	1.17	1.23	1.25	1.33	1.25	1.26	1.30	1.20

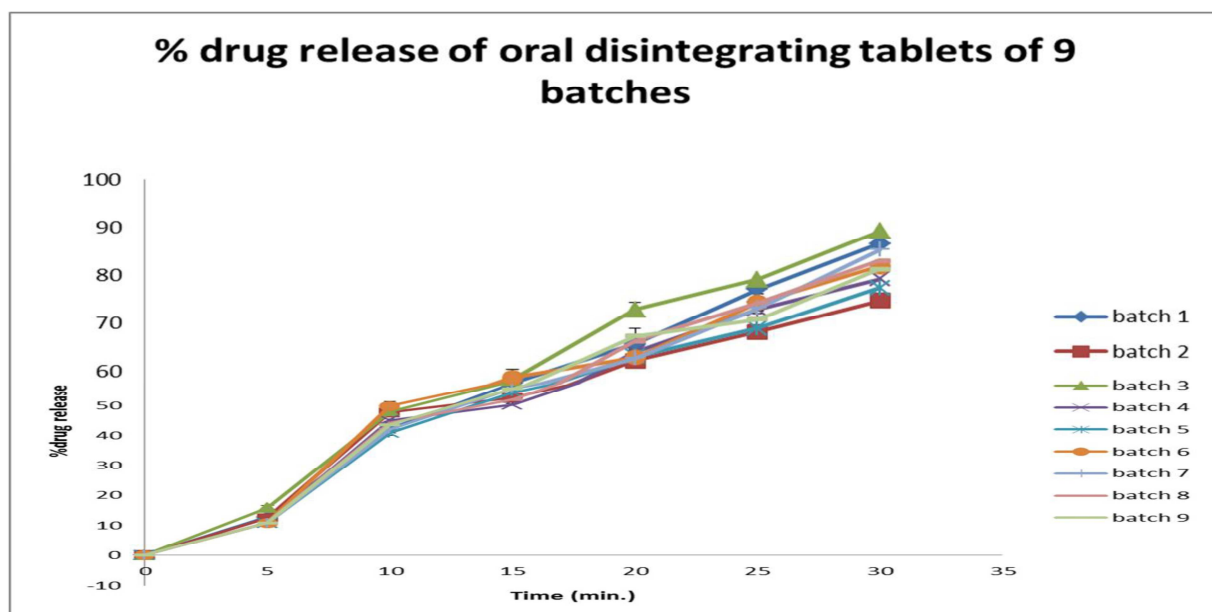
Evaluation of Oral Dispersible Tablet :

TABLE : 2 Result of Tablet Evaluation

Parameters	Batch A1	Batch A2	Batch A3	Batch A4	Batch A5	Batch A6	Batch A7	Batch A8	Batch A9
Hardness (KN)	6	6	6.1	6.2	6	6.1	6	6	6.2
Thickness	2.8	2.7	2.7	2.7	2.8	2.7	2.7	2.6	2.8
Friability (%)	0.90	0.93	0.92	0.92	0.90	0.94	0.92	0.93	0.91
Weight Variation	509	501	500	505	500	504	503	504	503
Disintegration Time (Sec)	42	33	39	34	38	38	32	44	45
Wetting Time Time(Sec)	14	12	15	9	18	20	17	10	19

Dissolution Study**TABLE : 3 Dissolution Study Data**

Time (min.)	Cumulative % Drug Release								
	Batch A1	Batch A2	Batch A3	Batch A4	Batch A5	Batch A6	Batch A7	Batch A8	Batch A9
0	0	0	0	0	0	0	0	0	0
5	12.69	12.26	15.69	10.69	10.11	11.69	10.21	11.23	10.80
10	42.12	47.67	47.95	45.03	41.78	49.78	42.03	44.12	43.53
15	57.38	52.50	58.21	50.21	54.38	58.55	55.62	51.96	55.62
20	65.65	62.04	72.81	63.81	62.98	62.73	62.56	66.14	67.31
25	77.08	68.11	79.07	72.90	68.90	74.33	73.16	74.33	70.74
30	86.51	74.65	89.16	79.16	77.33	81.83	85.25	83.00	81.25

**Figure :1 drug release of batch A1 to A9****5. Drug Excipients Interaction Study :****FT-IR Spectroscopy Method**

It is used to study the interactions between the drug, polymer and excipients. The drug and excipients must be compatible with one another to produce a product stable, efficacious and safe. IR spectral analysis for Montelukast Sodium & Levocetirizine Hydrochloride. MCC P101 Primojel, Primellose are obtained with FT-IR spectroscopy using KBr pelleting. The range was from 500 to 4000 cm. [10],[14],[16].

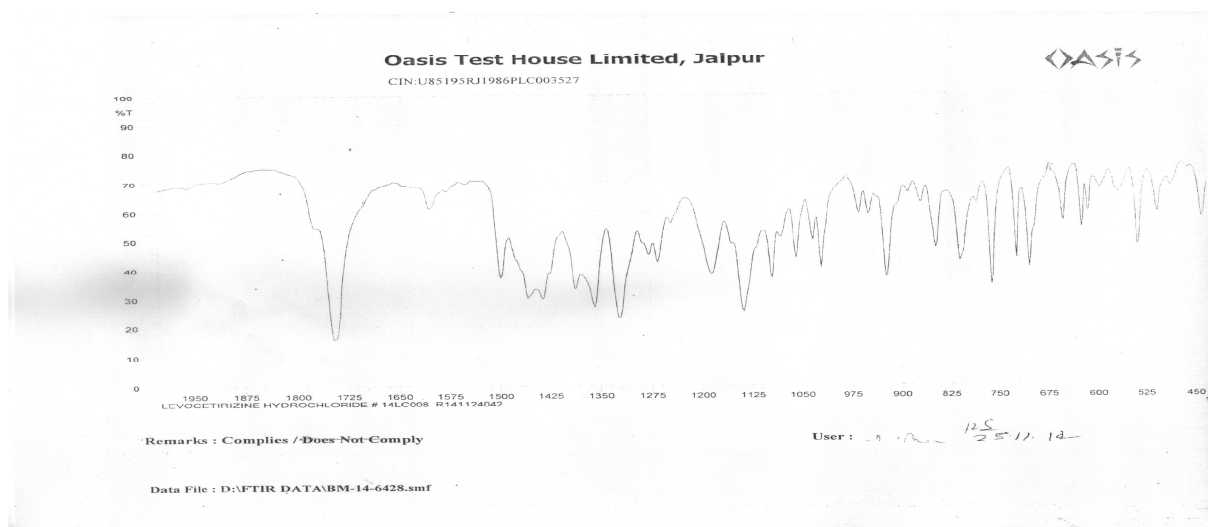


FIGURE- 2 IR spectra of Levocetirizine Hydrochloride

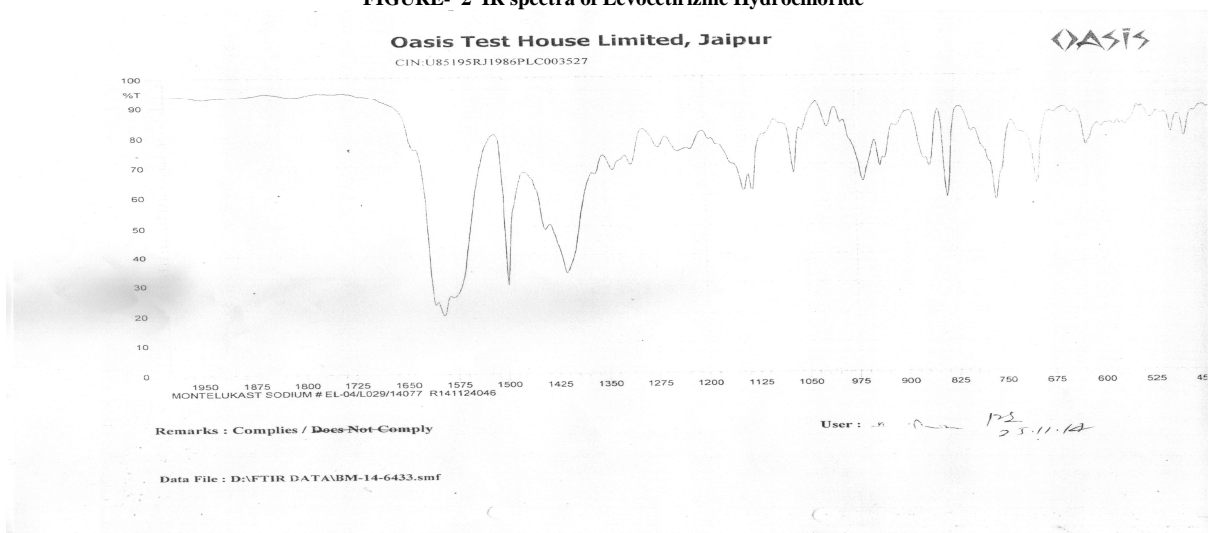


FIGURE- 3 IR spectra of Montelukast Sodium

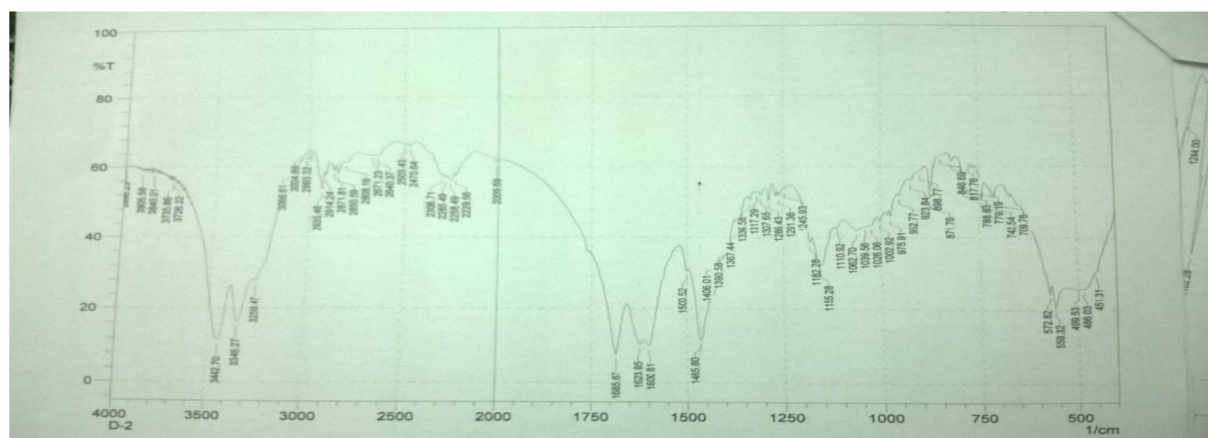


Figure 4 : IR spectrum of API Drug & Primojel

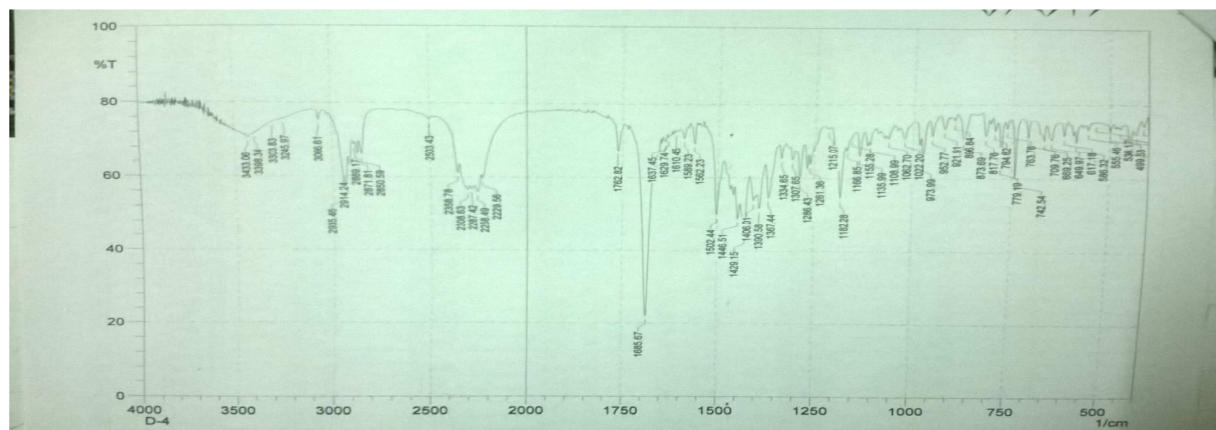


Figure 5 : IR spectrum of API Drug & Primellose

Summary

The aim of present investigation was to formulate and evaluate of oral dispersible tablet of levocetirizine dihydrochloride and montelukast sodium. Levocetirizine dihydrochloride is Antihistaminic Drug, and Montelukast sodium is Antiasthmatic Drug. This oral dispersible tablet dissolved in pH 6.8 in saliva. Development of oral dispersible tablet dosage form can be advantageous, that can provide quickly disintegrate in saliva and increase efficacy of the dosage form. In dissolution profile batch A3 is give a good % release of drug with superdisintegration (primogel). In Simultaneous estimation curve show that three drugs (Levocetirizine Dihydrochloride and Montelukast Sodium) release in tablet simultaneous. So, finally obtained batch A3 which is suitable for our experiment.

CONCLUSION

Oral dispersible tablet of Levocetirizine Dihydrochloride and Montelukast Sodium was prepared by dry granulation method using primogel superdisintegrant. Tablets disintegration oral cavity and acceptance friability and hardness. In vitro drug releasing from the tablets shows the significantly improved the drug dissolution. Hence it could be conclude that the superdisintegrant based oral dispersible tablet of Levocetirizine Dihydrochloride, and Montelukast Sodium would be quite effective in emesis, providing quick onset of action without need of water for administration

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