International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 3 May-June 2025, pp: 1646-1654 www.ijprajournal.com ISSN: 2456-4494

Development of Formulation and Evaluation of Fexofenadine Hydrochloride Uncoated Tablet by Wet Granulation Method

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Date of Submission: 10-06-2025 Date of Acceptance: 20-06-2025

ABSTRACT:
The development and evaluation of Fexofenadine hydrochloride(HCl) uncoated tablets were aimed at formulating and effective and patient compliant dosage form for the treatment of allergic rhinitis and uticaria. The formulation process included the selection of suitable binder and lubricant to ensure uniformity and stability. The tablets were prepared using direct compression followed by evaluation of their physiochemical properties including weight variation test, hardness, friability, disintegration time and dissolution test.Result demonstrated that the developed Fexofenadine HCl uncoated tablets exhibited desirable characteristics with consistent release profiles, and satisfactory stability making them a promising formulation for clinical use.

Purpose:The aim of this study is to formulate and evaluate fexofenadine HCl uncoated tablet for the effective treatment of seasonal allergy rhinitis and for treatment of chronic urticarial and to comply dissolution study with USP limits.

Method: Fexofenadine hydrochloride uncoated tablet 250mg were manufacture using a wet granulation method. The powder blend and granule mixture were evaluated various pre-compression characteristics such as angle of repose, compressibility index and Hauser's ratio. The tablet were evaluated for post compression features including weight variation, hardness, thickness, friability, disintegration time and dissolution test.

Result: The result show that the F6 formulation 250mg of tablet were selected as the best formulation.

Conclusion: Fexofenadine HCl available in market as film coated tablet form having slow release drug profiles. In this study it was tried to formulate Fexofenadine HCl by wet granulation method to improve drug release profile. Based on various study we have carried out six trails. Based on preliminary study various formulation studies F1-F6 were carried out different concentration of diluents, disintegrant, binders and lubricant are added. Fexofenadine HCl tablet were formulated by wet granulation method. From all trails we have confirmed F6 as confirmatory trail and evaluated for post compression parameter.

Keywords: Fexofenadine, uncoated tablet.

I. INTRODUCTION:

Fexofenadine hydrochloride is a second generation, peripheral histamine H1- receptor antagonist drug. It was developed by Hoechst Marion Roussel and granted a patent approval in 1979.The drug was originally synthesized in 1993

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by the Massachusetts based biotechnology company separator and approved by the US Food and Drug administration on 30 July 1996 for the relief of chronic idiopathic urticaria and seasonal allergic rhinitis. Fexofenadine is commonly considered an ‘inverse agonist’ because it stabilizes the inactive configuration of the H1 receptor, which in turn helps to alleviate the histamine-induced allergic responses. Fexofenadine is a non-sedating drug because of its negligible impact on cognitive performance. In patients with chronic urticaria, it appeared to reduce the levels of tryptase, vascular cell adhesion molecule-1 (VCAM-1) and endothelial leukocyte adhesion molecule-1 (ELAM-1) suggesting anti-inflammatory benefits through cytokine regulation. This medication can be used off label to treat allergic conjunctivitis angioedema, eczema, and reactions to insect bites and stings. The drug is available as tablets,suspension, and orally disintegrating tablets and is administered at a dose of 60mg,120mg,and 180mg in film coated tablet[1].

Fexofenadine, a H1-receptor antagonist used as an oral tablet in the treatment of allergic rhinitis and chronic idiopathic urticaria, undergoes minimal metabolism and is frequently used as a probe substrate for the efflux transporter P-glycoprotein .It is also a substrate for various uptake transporters ,including human hepatic OATP1B3.In the current study, Fexofenadine was administered orally to human volunteers at doses of 100ug or 120mg in order to compare its Pk obtained from a microdose to dose from a therapeutic dose .In addition ,to fully characterize fexofenadine ,its disposition kinetics following intravenous (IV)administration was assessed, as its clearance ,volume of distribution and absolute oral bioavailability are currently unknown. In order to ensure adequate assay sensitivity for the microdose, fexofenadine was administered as the 14C-labelled drug and the ultra-sensitive method of accelerated mass spectrometry(AMS) was used to determine the plasma drug concentrations over time[2].

Fexofenadine belongs to pregnancy category C, and it does not cross the blood-brain barrier. The adverse effects linked to the drug include back pain, dyspepsia, dysmenorrhoea, dizziness, nausea, fatigue ,drowsiness ,dry mouth, and the most commonly stated effect is headache. The drug does not cause any cardio toxicity and entails minimal hepatotoxicity.

Fexofenadine is a second generation, non-sedating antihistamine primarily used to treat allergic conditions such as seasonal allergic rhinitis and chronic urticaria. It works by blocking histamine H1 receptors, receptors reducing allergy symptoms like sneezing, running nose, itchy watery eyes, and skin rashes.

Fexofenadine is a peripheral H1 -receptor antagonist that works by blocking the effects of histamine, a substance produced by the immune system during allergic reactions unlike first generation antihistamines e.g., Diphenhydramine

Dosage of Fexofenadine is typically taken once or twice a day, depending on the specific condition being treated. The usual dose for adults and children over 12 years old ranges from 60mg to 180mg per day[3].

It is generally well tolerated with side effects being relatively mild. Some people may experience headaches, dizziness, or dry mouth. Importantly, because it is much less likely to cause drowsiness compared to older antihistamine.

Fexofenadine can interact with certain medications, such as those that affect the liver or stomach acid, and high doses of fruit juice (like grape fruit or apple juice) can reduce its absorption[4].

Fexofenadine was first approval by the US food and drug administration (FDA) in 1996 as a prescription drug for the treatment of seasonal allergic rhinitis and Chronic urticaria.

OTC approval; in 2002, Fexofenadine was approved for the over the counter (OTC) use in lower doses, making it available without a prescription for people suffering without a prescription for people suffering from hay fever and other allergy symptoms[4].

Formulationdevelopmentof Fexofenadinehydrochloride 180 mg tablet

Formulation	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
Fexofenadine	180mg	180mg	180mg	180mg	180mg	180mg

Micro crystalline cellulose	30mg	_	20mg	40mg	_	30mg
Starch	_	30mg	_	_	50mg	10mg
Lactose monohydrate	_	30mg	30mg	_	10mg	_
Purified water	Quantity sufficient	Quantity sufficient	Quantity sufficient	Quantity sufficient	Quantity sufficient	Quantity sufficient
Croscarmellose Sodium	20mg	_	20mg	20mg	_	20mg
Polysorbate 80	_	5mg	_	_	_	_
Talc	_	15mg	_	10mg	_	10mg
Magnesium stearate	20mg	_	20mg	_	10mg	_

Improvisation of trial

Formulation F1

Formulation F1was carried out by using croscarmellose sodium as the disintegrant microcrystalline cellulose in granulation method. The dried granules were lubricated with magnesium stearate. But the flow of the powder was not good during compression.

Formulation F2

Formulation F2 was carried by using a pregelatinized starch in granulation method. Lactose monohydrate is added to reduce the disintegration time. The dried granules was lubricated with talc the flow property was not good during compression.

Formulation F3

Formulation F3 was carried by using croscarmellose sodium as the disintegrant microcrystalline cellulose are lubricated for drying granules. The flow property of powder was showed better results compared with previous trial.

Formulation F4

Formulation F4 was carried out by using lactose monohydrate as a diluent. The croscarmellose sodium as a disintegrant. Talc is used as lubricant.

Formulation F5

In this trial starch as a glidant. Granules are made by lactose monohydrate. The dried granules are lubricated with magnesium stearate.

Formulation F6

In this trial croscarmellose sodium as a disintegrant. Micro crystalline cellulose as a diluents. Starch is used as a binder and lubricated

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with talc good flow property. Formulation F6 was carried out as a confirmatory trial.

Evaluating the Mixture of Powders :

The main flowability properties of powders before compression were characteristics by the angle of repose, compressibilityindex and Hauser's ratio.

Angle of repose: The angle of repose can be used to calculate the frictional force in a powder. It is defined as the greatest possible angle between the surface of the powder pile and the horizontal plane. When more powder is added to the pile, it slides down the sides until the mutual friction of the particles, which produce a surface angle equals the gravitational force. The angle of repose was measured using the fixed funnel method. A funnel was secured with its tip at a specific height (h) above graph paper placed on a flat horizontal surface. The mixture was carefully poured through the funnel until the apex of the conical pile was just touching the funnel tip. The radius (r) of the conical piles base was measured. The following formula was used to calculate the angle of repose.[8,10,16],

$$\tan ø = h/r$$

where,
h denotes Height
r denotes radius of cones base

Compressibility Index: The flowability of powder may be evaluated by comparing the bulk density (ρb) and tapped density (ρt) of powder and the rate at which it packs down. The percentage of compressibility index was calculated as,

$$\text{Compressibility index} = \frac{\text{Tapped density} - \text{Bulk density} \times 100}{\text{Tapped density}}$$

Hausner's Ratio: Hausner's Ratio is an important character to determine the flow property of powder. This can be calculated by the following formula: ρt/ρb[9].

Physiochemical Evaluation of the fexofenadine hydrochloride uncoated tablet (250mg)

The following physiochemical tests were conducted to evaluate the tablets

Weight variation test: Twenty tablets were selected and weighed individually and the weights of tablets were compared with the calculated mean weight. In this method not more than two tablets should have a deviation greater than pharmacopoeia limits ± 5% of the weight.

Thickness test:

The thickness of the tablet was determined using a vernier calliper. Fine tablet from each type of formulation were used and average values were calculated. It is expressed in mm.[15,16.]

Hardness test:

The resistance of tablet to shipping, breakage, under conditions of storage, transportation and handling before usage depends on its hardness. For each formulation, the hardness of 6 tablets was determined using the Monsanto hardness tester. The tablet was held along its oblong axis in between the two jaws of the tester. At this point, reading should be zero kg/cm². Then constant force was applied by rotating the knob until the tablet fractured. The value at this point was noted.[19]

Friability test:

Friability is the phenomenon where the surface of the tablet is damage or shown a site of damage due to mechanical shock. It is tested by using Roche friabilator. This is made up of a plastic drum fixed with a machine which rotated at 25rpm for 100 revolutions (25×4=100). Tablet falls from 6 inches, height in each turn with in the apparatus.[16,18,20]

Percentage friability = W1- W2/ W1×100
W1= weight of tablets before testing
W2 = weight of tablets after testing

Limits:

According to USP = percentage of friability should be not more than 1%.

Disintegration studies: The process of breakdown of a tablet into smaller particles is called as disintegration. The invitro disintegration time of a tablet was determined using disintegration test apparatus. Place 1 tablet in each of the six tubes of the basket.Add a disc to each tube and run the apparatus using distilled water maintained at 37 ±˚ 2˚c as the immersion liquid the assembly should be raised and lowered between 30 cycles per minute in the 0.001N HCL maintained at 3=˚± 2˚c. The time in seconds taken for complete disintegration of the tablet with no palpable mass remaining in the apparatus was measured and recorded[14].

II. RESULT AND DISCUSSION

Evaluation of Powder Blend and Granules

The results for evaluation of powder blend and granular formulations are in Table:1

S.No	Formulation code	Bulk density(g/cc)	Tapped density(g/cc)	Carr's Index(%)	Hausner's Ratio(%)	Moisture content
1	F1	0.387	0.537	27.93	1.38	3.59
2	F2	0.425	0.582	26.97	1.36	2.77
3	F3	0.443	0.590	24.91	1.33	0.86
4	F4	0.421	0.550	23.45	1.30	1.62
5	F5	0.382	0.489	21.88	1.28	4.16
6	F6	0.393	0.497	20.92	1.2	4.78

Compressibility index for powder blend was found to be 20.92.Hausner's ratio for powder blend was found to be 1.27.From the observed values the flow type is passable in direct compression and good in wet granulation. Angle of repose for powder blend was found to be 30°.54' which is well within the specification limit of 30° to 35° and the flow type is good.

Physiochemical evaluation of fexofenadine hydrochloride uncoated tablets (250mg)

Tabletswere prepared by direct compression and wet granulation methods. They was exposed to all of the physiochemical tests. Physiochemical tests were conducted on complete tablets including thickness, hardness, friability, weight variation test and disintegration time. All tablets had similar condition in the weight variation test in pharmacopoeia limits i.e. ±5%.Physiochemical evaluation of 250mg Fexofenadine hydrochloride uncoated tablet by direct compression method and wet granulation method.Table:2

S.No.	Formulation code	Thickness (mm)	Hardness (kg/cm^2)	Friability	Weight variation (mg)	Disintegration time With Disc	Disintegration time With-out disc
1	F-1	5.80±0.04	10.5±0.42	0.11	599.98±0.02	0.33''	0.35''
2	F-2	6.21±0.07	9.50±0.35	0.16	602.25±0.01	0.37''	0.41''
3	F-3	5.50±0.06	5.50±0.22	0.065	627.20±0.07	3.40''	4'.22''
4	F-4	5.49±0.08	5.50±0.04	0.049	600.16±0.22	1'.22'	1'.33''
5	F-5	4.95±0.15	10.5±0.28	0.067	600.5±0.04	0.31''	0.28''
6	F-6	5.01±0.12	9.50±0.03	0.085	599.1±0.08	0.38''	0.30''

The thickness of the tablet was found to be between 4.95 to 6.35 mm respectively.This is due to the using different tooling size and the hardness of formulation was in the range of 5.5 to 11.5 kg/cm^2.The friability of the tablet was found to be within 1 %. All the above trail formulation have passed the friability test. All the tablet from the above trails disintegrated within the limits. Hence the disintegration tests were passed.

IN-VITRO DISSOLUTION STUDIES OF FEXOFENADINE HYDROCHLORIDE UNCOATED TABLET – 250mg

S.No	Formulation code	% of drug release 10 minutes	30 minutes
1	F1	74.95	85.08
2	F2	70.70	83.14
3	F3	85.55	88.53
4	F4	89.27	87.99
5	F5	89.77	91.81
6	F6	91.52	96.25

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FITR SPECTRAL STUDIES FOR API AND EXCIPIENTS

FTIR Spectrum of Fexofenadine Hydrochloride

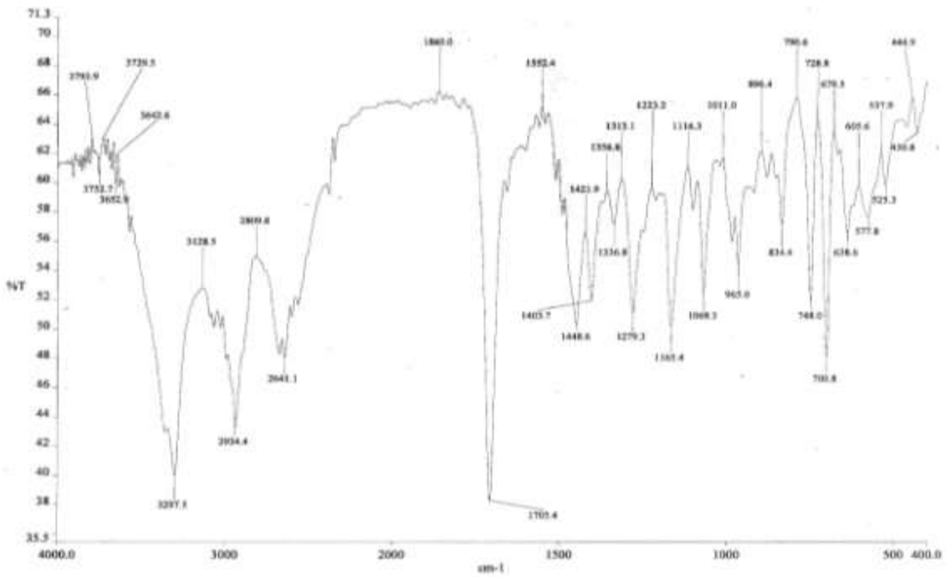

Figure-1

FITR Spectrum of Fexofenadine hydrochloride + entire all excipients

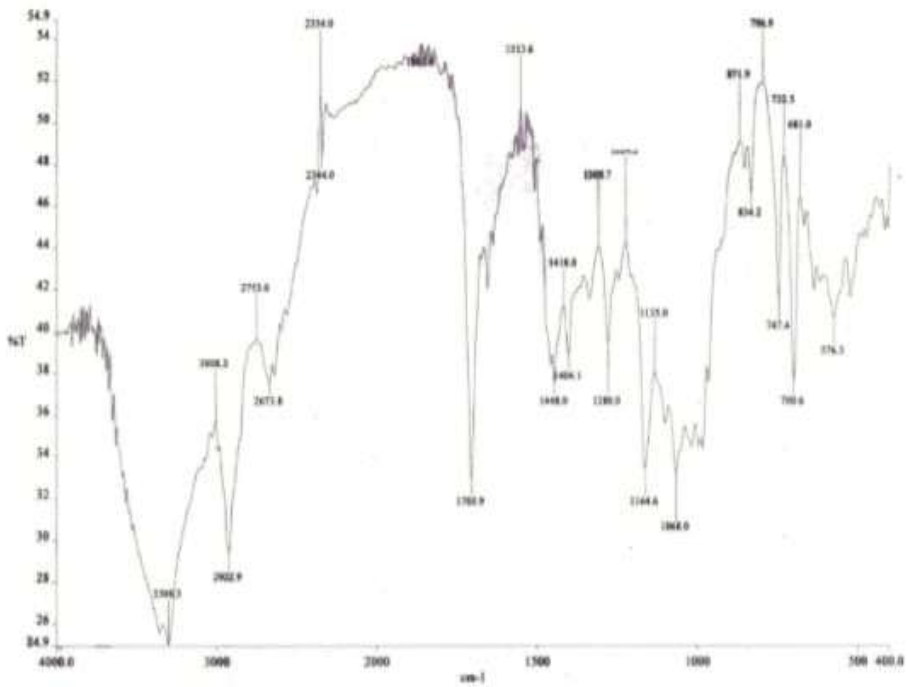

Figure-2

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FTIR Spectrum of Fexofenadine Hydrochloride + magnesium stearate

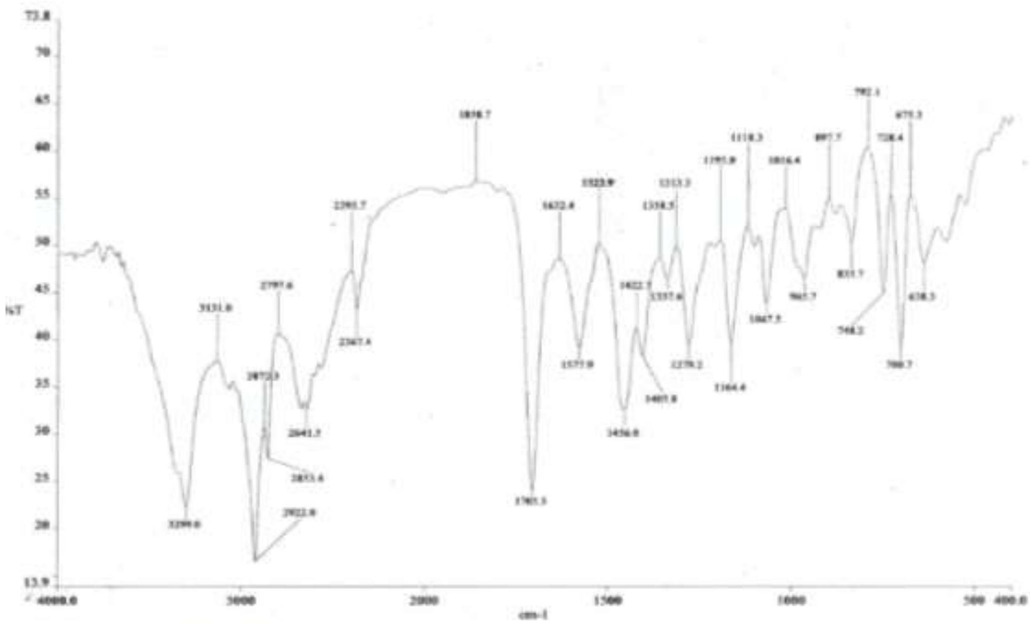

Figure-3

FTIR Spectrum of Fexofenadine Hydrochloride + Croscarmellose sodium

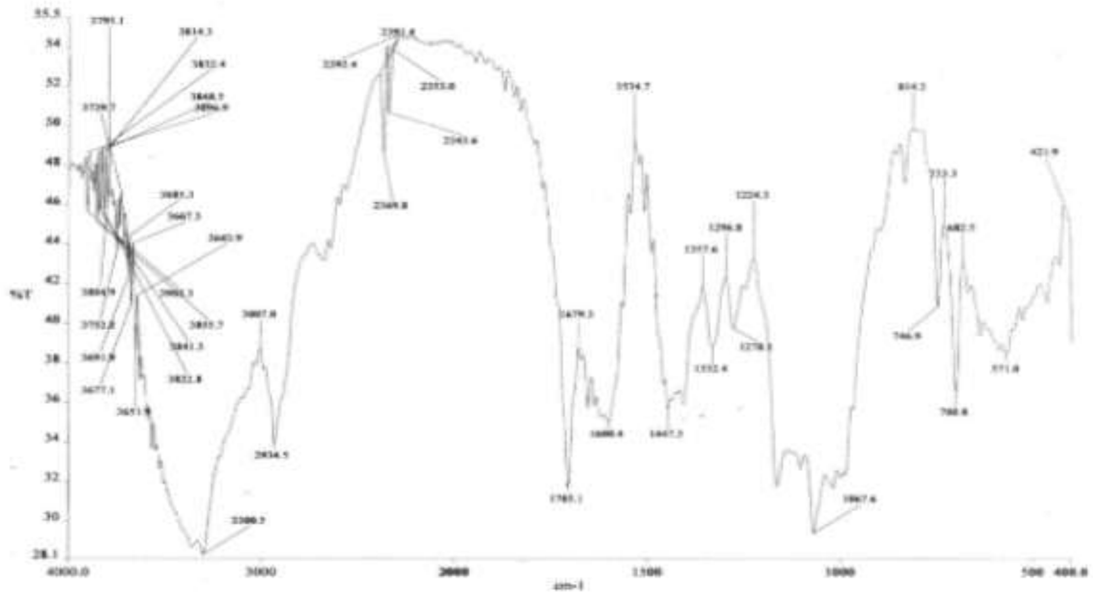

Figure-4

Comparison of dissolution profile of F1-F3

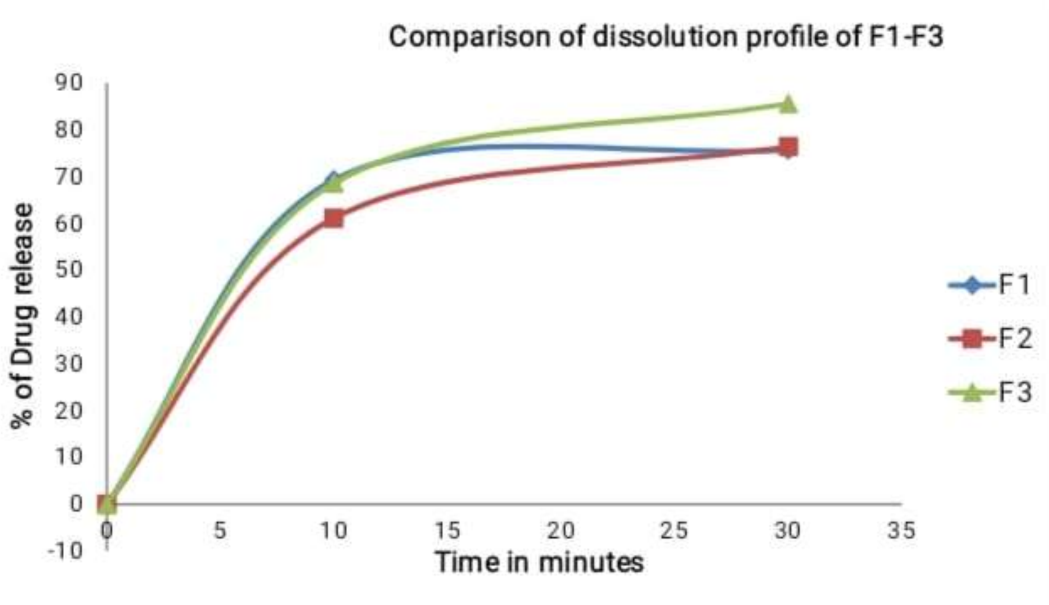

Figure-5

Comparison of dissolution profile of F4-F6

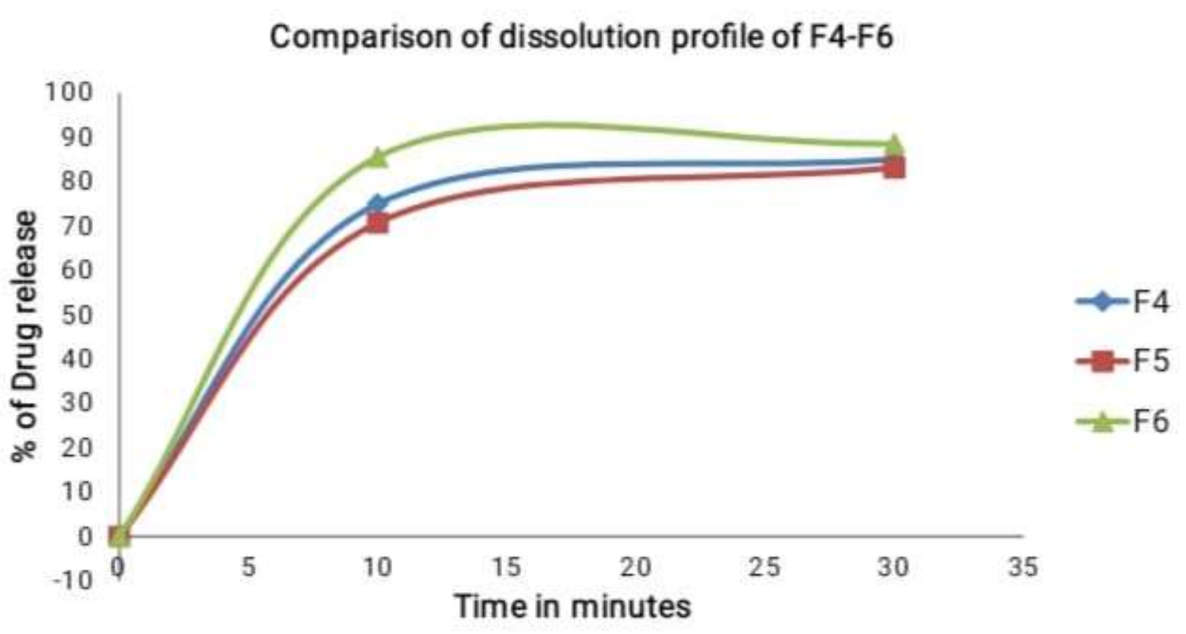

Figure-6

III. CONCLUSION

Fexofenadine HCl available in market as film coated tablet form having slowreleasedrug profiles. In this study it was tried to formulate Fexofenadine HCl by wet granulation method to improve drug release profile. Based on various study we have carried out six trails. Based on preliminary study various formulation studies F1-F6 were carried out different concentration of diluents, disintegrant, binders and lubricant are added.Fexofenadine HCl tablet were formulated by wet granulation method. From all trails we have confirmed F6 as confirmatory trail and evaluated for post compression parameter.

BIBILOGRAPHY

[1]. David Axelrod,LeonardBielory.Fexofenadine hydrochloride in the treatment of allergic disease. Journal of Asthma and Allergy. Sep2008 ;19-29.

[2]. Jurgen Bruning, Martin U Schmidt.A brief Practical Introduction with Fexofenadine hydrochloride as example.Journal ofPharmacy and Pharmacology. June 2015;67(6):773-781.

[3]. Harold S. Nelson MD, Robert Reynold, Jolene Mason RN. Fexofenadine HCL is a safe effective for treatment of chronic idiopathic urticaria, Annals of Allergy,and Immunology. May 2000; 84(5): 517-522

[4]. Ahmed .S,etal. Fexofenadine HCL Immediate Release tablets,Bangladesh pharmaceuticalJournal. 16(1):1-9

[5]. KalaLakshmi Sujatha, M. Lakshmi Prasanna, N.V.V. Jagan Mohan Reddy. Formulation and Evaluation of Fexofenadine HCL oral dispersable tablets. International Journal of Research in engineering, science & management. July 2000;(7): 75-81.

[6]. UB Bolmal, Utkarsh U Gaonkar, APGadad.Design & Characterization of solid dispersed Fexofenadine HCL buccal film by central composite design, International Journal of Pharmaceutical science & Research. 2016; 7(10): 40974109.

[7]. Suraj R Magar, prof.Vaibhav P.Gote et.al.Preformulation studies. International Journal of creative Research thoughts. October 2023; 11(10):345

[8]. AyanamVasanthi, Ayanam Vasavi et.al. Design,Formulation and Evaluation of Fexofenadine HCL Immediate release tablets by solid dispersion method using solvent evaporation techniques. Asian Journal of Pharmacy and Technology. 2022;12(4)

[9]. Sachin S.Gaikwad, Kishor.S.Salunkhe. Hausner’s.InternationalJournal of pharmaceutics. March 2023, 635:.

[10]. S.B Tan, R.C. Moreton, D.smith.Flow properties and tablet weight uniformity.Journal of pharmacy and pharmacology; volume-31, Issue, December 1979. Page no: 74

[11]. Leon Lachmann,Herbert A, Liberman, Joseph L. Kaing,The theory and practice of Industrial Pharmacy: page.no 293- 303

[12]. Sachin Gholve. et al, Formulation and evaluation of immediate release tablets of Fexofenadine hydrochloride, Journal of pharmacy research 2016, 10(2) 90-96.

[13]. Hitesh Chaturvedi et al; European Journal of Pharmaceutical and medical research; Post-compression Evaluation Parameters,2017, 4(11),526-530.

[14]. Md Abubakar, Sukbir Kaur, Process capability impronemant using define measure analyze, improve and control approach in the manufacturing of Fexofenadine HCL the manufacturing of Fexofenadine HCL tablet pharmaspire 2020; 12(2) 5054

[15]. Shahrian Ahmed, Mehrina Nazmi, Ikramul Haran, Sabiha Sultana, shimul Hadar, MD selim Reza; Fexfenadine HCL immediate release tablets: In vitro characterization & evaluation of excipients; Banglagesh pharmaceutical Journal 16(1): 1-9,2013

[16]. Jaimin Modi, Ravindra kamble, Dr.chetansingh chauhan, Nisarg patel; Formulation development & optimization of immediate release tablet of Fexfendine HCL; Journal of pharmaceutical Science & bioscientific Research volume 3,Issue 2; March April 2013(51-61)

[17]. Renuka et al, Design and characterisation of dispersible tablet of fexafenadine HCL, World Journal of pharmacy and pharmaceutical sciences : Volume 4, Issue 05, 615 – 629

[18]. Vamshi Vishnu Yamsani et. al; Preparation & evalution of fexofenadene HCL orally disintegrating tablets using neem gum as binder ; Journal of pharmacy Research 2014 8 (7), 864 – 870

[19]. Wells J. Pharmaceutical formulation: the physic chemical properties of drug substances. In Aulton ME, editor. Pharmaceutics: the science of dosage form design. 2nd edition. London: Churchill Livingstone, 2002; 133 – 34

[20]. Jadhav SB, Kaudewar DR, Kaminwar GS, Jadhav AB, Kshinsagar RV, Skarkar DM. Formulation & evaluation of dispersible tablets of Dilitiazem HCL International Journal Pharm tech res, 2011; 3(3): 1314