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FORMULATION AND EVALUATION OF MOUTH DISSOLVING TABLETS OF FEXOFENADINE HYDROCHLORIDE

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Abstract:
In the present work, mouth dissolving tablets of fexofenadine HCl were designed with a view to enhance patient compliance by direct compression method. The present work studied the effect of superdisintegrants on release rate of fexofenadine HCl in the form of fast disintegrating tablet. For the present study range of superdisintegrants in their different concentrations, were used. The superdisintegrants used were Magnesium stearate, Microcrystalline Cellulose, Cross Povidone, Sodium Starch Glycolate,and Cross Carmellose Sodium. The blends were prepared by direct compression technique. The tablets were evaluated for hardness, thickness, friability, drug content, weight variation and in-vitro drug release studies in pH 6.8.

Keywords: *Fexofenadine hydrochloride, Mouth Dissolving Tablets, Magnesium Stearate, Microcrystalline Cellulose, Cross Povidone, Sodium Starch Glycolate,and Cross Carmellose Sodium*

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INTRODUCTION:

Many patients have difficulty to swallow tablets and hard gelatin capsules and thus does not comply with prescription, which results in high incidence of non-compliance and ineffective therapy. It is estimated that 50% of the population is affected by this problem. Recent advances in Novel Drug Delivery Systems (NDDS) aim to enhance safety and efficacy of drug molecule by formulating a convenient dosage form for administration and to achieve better patient compliance. One such approach is Fast Dissolving Tablets (FDT) [1-5].

According to European Pharmacopoeia, the FDT should disperse/disintegrate in less than three minutes. The basic approach used in development of FDT is the use of superdisintegrants like cross linked carboxymelhylcellulose (croscarmellose), sodium starch glycolate (Primogel, Explotab), polyvinylpyrrolidone (Polyplasdone) etc. which provide instantaneous disintegration of tablet after putting on tongue, thereby releasing the drug in saliva. Their growing importance was underlined recently when European pharmacopoeia adopted the term Orodispersible tablet as a tablet that to be placed in the mouth where it disperses rapidly before swallowing. The bioavailability of some drugs may be increased due to absorption of drug in oral cavity and also due to pregastric absorption of saliva containing dispersed drugs that pass down into the stomach. More ever, the amount of drug that is subjected to first pass metabolism is reduced as compared to standard tablet. The technologies used for manufacturing fast-dissolving tablets are freeze-drying, spray-drying, tablet molding, sublimation, sugarbased excipients, tablet compression, and disintegration addition. As a result of increased life expectancy, the elderly constitute a large portion of the worldwide population today [6-7]. These people eventually will experience deterioration of their physiological and physical abilities. fexofenadine HCl is a non-sedating anti-histamine used in systemic relief of allergic conditions including seasonal allergic rhinitis and urticaria [8]. Fexofenadine HCl was preferred as a model drug for formulation development. Fexofenadine HCl is biopharmaceutical classification system type II as it possesses low solubility and high permeability. This depicts its good bioavailability which in turn suggests its ideal candidature for fast disintegrating drug delivery system. It is indicated for the relief of symptoms associated with seasonal allergic rhinitis in adults and children 2 years of age and older and for treatment of uncomplicated skin manifestations of chronic idiopathic urticaria in adults and children 6 months of age and older. These conditions are commonly found in pediatric patients, where palatability is of main concern. In case of conventional tablets there is problem of swallowing of tablet particularly in pediatric patient. In many orally disintegrating tablet technologies based on direct compression, the addition of superdisintegrants principally affectsthe rate of disintegration and hence the dissolution. The presence of other formulation ingredients such as water-soluble excipients and effervescent agents further hastens the process of disintegration. Although superdisintegrants primarily affect the rate of disintegration, but when used at high levels they can also affect mouth feel, tablet hardness and friability [9]. In the present work an attempt was made to formulate fast disintegrating tablet of fexofenadine HCl which get disintegrate in saliva which overcome swallowing problem especially for pediatric patients. So, even elder people who have swallowing or chewing difficulties experience ease of administration. Moreover these tablets have sufficient mechanical integrity to withstand rigors of mechanical shocks during processing and shipment without breakage.

MATERIALS AND METHODS:

All the materials used in the formulations and evaluations are given below

Table 1: Materials

S. no	Materials
1	Fexofenadine Hydrochloride
2	Magnesium stearate
3	Talc
4	Microcrystalline Cellulose
5	Cross Povidone
6	Sodium Starch Glycolate
7	Cross Carmellose Sodium
8	Aerosil

Table 2: Equipments used and their Models

EQUIPMENTS/ INSTRUMENTS

S. no	Equipment	Manufacturer
1	U.V-Visible Spectrophotometer	Labindia UV 3000 Spectrophotometer
2	Digital Balance	Essae Model fb 3000 Digital Balance
3	Sensitive Balance	Jeroy km2 Sensitive Balance
4	Ph Meter	Labindia Ph Analyser
5	Tablet Punching Machine	Rimek Mini Press-II
6	Paddle Type Dissolution Apparatus USP 2	Labindia DS800
7	Fourier-Transformed Infrared (FTIR) Spectrophotometer	Perkin Elmer,Japan
8	Hardness Tester	Monsanto Ltd
9	Friability Apparatus	Labindia FT 1020 tablet Friability Tester
10	Disintegration Apparatus	Labindia DT1000
11	Magnetic Stirrer	Remi equipments
12	Hot Air Oven	Universal Q-5247

Preformulation Studies:

Preformulation testing is the first step in the rationale development of the dosage forms of the drug substance. It can be defined as the investigation of the physical and chemical properties of the drug substance alone and when combined with the excipients. It gives extensive information to bring out good quality with high standard at desired optimal dosage.

Solubility: Solubility of Fexofenadine Hydrochloride was determined using different solvents. It was observed that it is sparingly soluble in water and chloroform, completely soluble in ethanol and methanol and insoluble in hexane.

Drug polymer compatibility studies: Study was carried out using Fourier-Transformed Infrared (FTIR) Spectrophotometer. FT-IR of Fexofenadine Hydrochloride and polymers were obtained. The spectrum was studied for specific peaks of drug and polymers.

Determination of absorption maximum λ_{max} :A stock solution was prepared by dissolving 50mg of Fexofenadine Hydrochloride in 10ml of methanol and 40ml of 6.8pH phosphate buffer (1000mcg/ml). The resultant solution was scanned in range of 200-400nm on Shimadzu UV-Visible spectrophotometer and absorption maximum was determined.

The effect of dilution on λ_{max} was studied using by diluting the above solution to 100mcg/ml and scanned from 200-400nm. From the spectra of drug max of Fexofenadine hydrochloride, 224nm was selected for the analysis.

Construction of standard calibration curve using 6.8 ph phosphate buffer: Procedure for construction of calibration curve of Fexofenadine Hydochloride in 6.8pH Phosphate Buffer:

Standard stock solution: A stock solution containing 50mg of pure drug Fexofenadine Hydrochloride was prepared by dissolving in 10ml of methanol and 40ml of 6.8pH phosphate buffer to produce 100ml (1000mcg/ml) solution in a volumetric flask.

Stock solution: from the stock solution, 10ml of stock solution was further diluted to make upto 100ml using 6.8pH phosphate buffer with concentration 100mcg/ml. Aliquots of 1ml, 2ml, 3ml, 4ml, 5ml were diluted upto 10ml with buffer to give concentrations in the range of 10µg/ml, 20µg/ml,30µg/ml,40µg/ml,50µg/ml concentration of Fexofenadine Hydrochloride respectively. The absorbance was measured in the UV-Visible spectrophotometer at 224nm using methanol and 6.8pH phosphate buffer as a blank solution and graph of concentration versus absorbance was plotted.

Pre-Compression Parameters:

Angle of repose: Angle of repose has been defines as the maximum angle possible between the surface of the pile of the powder and horizontal plane. It is performed to determine the flow rate of powder done by the funnel method. The powder mass was allowed to flow through the funnel orifice kept vertically to a plane paper kept on the horizontal surface, giving a heap angle of powder on paper. The angle of repose was calculated by substituting the values of the base radius 'R' and the pile height 'H' in the following equation:

$$\theta = \tan^{-1} H/R$$

θ = angle of repose
H = height of powder cone
R = radius of the powder pile

Table 3: Angle of repose

Angle of repose (degrees)	Type of flow
<20	Excellent
20-30	Good
30-34	Passable
>40	Very poor

Angle of repose less than 30º shows the free flowing property of the material.

Loose Bulk Density: It is the volume in the graduated cylinder including both the particulate volume and the pore volume. It is defined as the mass of a powder divided by the bulk volume. It depends primarily on particle size distribution, particle shape and the tendancy of the particles to adhere to one another. It is determined by taking a sample of about 50cm^3 of powder, previously been passed through a standard sieve no.20, was carefully introduced into a 100ml graduated cylinder. The cylinder was dropped at 2second intervals on a hard wood surface three times from a height of 1inch. The bulk density of each formulation was calculated using following equation

Df= M/Vp

Where,

Df= bulk density

M= weight of sample in grams

Vp= final volume of powder in cm^3

Table 4: Bulk Density

Tapped Bulk Density: It is the volume in the graduated cylinder including both the particulate volume and the pore volume. It is defined as the mass of a powder divided by the bulk volume. It depends primarily on particle size distribution, particle shape and the tendancy of the particles to adhere to one another. It is determined by taking a sample of about 50cm^3 of powder, previously been passed through a standard sieve no.20, was carefully introduced into a 100ml graduated cylinder. The cylinder was dropped at 2second intervals on a hard wood surface three times from a height of 1inch. The bulk density of each formulation was calculated using following equation

Values	comments
Less than 1.25	Good flow
Greater than 1.5	Poor flow
Between 1.25-1.5	Addition of glidant normally improves the flow

Do= M/Vp

Where,

Do= tapped density

M= weight of sample in grams

Vp= final volume of powder in cm^3

Carr's Index: Carr's index is an indication of compressibility of the powder. The percentage compressibility of a powder was a direct measure of the potential powder arch or bridge strength and stability. Carr's index of each formulation was calculated using following equation.

Compressibility index (%) = (D_o-D_f/D_o) 100

Where,

D_f = fluff or poured bulk or bulk density

D_o = taped or consolidated density

Table 5: Carr's index as an indication of powder flow

Carr's index(%)	Type of flow
5-15	Excellent
12-16	Good
18-21	Fair to passable
23-35	Poor
33-38	Very poor
>40	Extremely poor

Carr's index greater than 25 is considered to be an indication for poor flowability and below 15 for good flowability.

Hausner's Ratio: Hausner's ratio is the measure of the propensity of a powder to be compressed. As such, it is a measure of the relative importance of inters particulate interactions. The hausner's ratio of the powder can be determined by the following equation.

Hausner's Ratio= TBD/LBD

Values of Hausner's ratio:

Lower hausner's ratio (<1.25) indicates better flow properties than higher ones (>1.25)

Formulation Design for Orodispersible Tablets of Fexofenadine Hydrochloride:

Preparation of Oral disintegrating tablets: In the present study, the rapid dispersible tabletsof Fexofenadine Hydrochloride are prepared by Direct compression method, using different polymer and concentrations.

Preparation of tablets by the direct compression technique

The steps followed in the formulation of ODT's by direct compression technique includes: Dry screening, weighing, mixing, mixing of Super Disintegrants, lubricant and glidant then compressing.

Procedure: All the required ingredients were passed through 40 mesh size to get uniform size particles and weighed accurately. Measured amount of drug, superdisintegrants, Avicel, sweetner and flavor except glidant and lubricant are mixed in increasing order of their weights in a mortar. To this mixture talc and magnesium stearate were added. The final mixture is manually shaken for 10mins in plastic bag. Final blend was compressed into tablets using 8mm s/c round, flat punches using Karnavathi, Rimek Compression Tablet Punching Machine.

Development of the formulation in the present study was mainly based on the type and concentration of polymers and properties of the drug. Various polymers in different concentrations were used so as to get tablets with good physical properties.

In the following formulations cross povidone, sodium starch glycolate and cross carmellose sodium were used in 4%, 8% and 12% concentrations each then another set of formulations were done using combinations of two superdisintegrants in different concentrations.

Evaluation of Orally Disintegrating Tablet Formulations:

Different quality control tests were performed for all the ODT formulations to check whether these have met the specifications given in USP along with other In vitro tests like wetting time and water absorption ratio.

Weight variation test:

Method: 20 tablets were randomly selected from each formulation and their average weight was calculated using digital balance (Denver, Germany). Then individual tablets were weighed and the individual weight was compared with an average weight, the variation in the tablet was expressed in terms of %deviation.

Table 6: Formulation design of Fexofenadine Hydrochloride Rapid dispersible tablets using different concentrations of superdisintegrants by direct compression technique:

Composition	T1	T2	T3	T4	T5	T6	T7	T8	T9
Fexofenadine HCl	30	30	30	30	30	30	30	30	30
Cross povidone	6	8	10	-	-	-	-	-	-
Sodium starch glycolate	-	-	-	6	8	10			
Cross carmellose sodium	-	-	-	-	-	-	6	8	10
Magnesium stearate	2	2	2	2	2	2	2	2	2
Aerosil	2	2	2	2	2	2	2	2	2
Microcrystalline cellulose	57	55	53	57	55	53	57	55	53
Talc	2	2	2	2	2	2	2	2	2
Mannitol (0.5,1,1.5)	1	1	1	2	2	2	3	3	3
Total weight	100	100	100	100	100	100	100	100	100

Table 7: Limits of weight variation

Average weight of tablet	% Weight variation
130mg or less	10
More than 130mg, less than 324mg	7.5
More than 324mg	5

Thickness measurement:
Method: Randomly 10 tablets were taken from each formulation and their thickness was measured using a digital screw guage, (Digimatic outside micrometer, Mitutoyo, Japan). The individual tablet was paced between two anvils of screw guage and sliding knob was rotated until the tablet was tightly fitted. The digital reading displayed was noted.

Hardness and Friability:
Method (Hardness): The tablet hardness of different formulations was measured using a Monsanto hardness tester. The tester consists of a barrel containing a compressible spring held between two plungers. The lower plunger was placed in contact with the tablet and a zero was taken.
The upper plunger was then forced against the spring by turning a threaded bolt until the tablet fractures. As the spring is compressed, a pointer rides along a guage in the barrel to indicate the force. The force of fracture is recorded, and the zero force reading is deducted from it. Generally, a minimum hardness of 4 kg is considered acceptable for uncoated tablets. The hardness for ODTs should be preferably 1-3 kg.

Method (friability): This test is performed using a laboratory friability tester known as Roche Friabilator . 10 tablets were weighed and placed in a plastic chambered friabilator attached to a motor, which revolves at a speed of 25 rpm, dropping the tablets from a distance of 6 inches with each revolution. The tablets were subjected to 100 revolutions for 4 mins. After the process, these tablets were dedusted and reweighed. Percentage loss of tablet weight was calculated.

Drug content uniformity: Five tablets were weighed individually and powdered. The powder equivalent to 30mg of fexofenadine hydrochloride was weighed and extracted in phosphate buffer 6.8pH and the concentration of drug was determined by measuring absorbance at 224nm by UV-Visible spectrophotometer.

Wetting time and water absorption ratio (R):
Method: Five circular tissue papers were placed in a Petri dish with a 10-cm diameter. Ten millimeters of water containing Eosin, a water-soluble dye, was added to the Petri dish. The dye solution is used to identify the complete wetting of the tablet surface. A tablet was carefully placed on the surface of tissue paper in the Petri dish at room temperature. The time required for water to reach the upper surface of the tablets and completely wet them was noted as the wetting time. To check for reproducibility, the measurements were carried out in replicated (n=6). The wetting time was recorded using a stopwatch.
The weight of the tablet before keeping in the Petri dish was noted (W_b) using Shimadzu digital balance. The wetted tablet from the Petri dish was taken and reweighed (W_a) using the same. The water absorption ratio, R, was determined according to the following equation:

$$R = 100 (W_a – W_b) / W_b$$

Where,
W_b and W_a are the weight before and after water absorption respectively.

Disintegration Time:
Disintegration time is considered to be one of the important criteria in selecting the best formulation. To achieve correlation between disintegration time In vitro and In vivo (in oral cavity) several methods were proposed, developed and followed at their convenience. One of the simple methods followed is described below.
Method: Disintegration time was also measured using a modified disintegration method. For this purpose, a Petri dish (10 cm diameter) was filled with 10ml of water.
Tablet was carefully put in the centre of the Petri dish and the time for the tablet to completely disintegrate into find particles was moved using a pump watch.

Dissolution test:
Method: Drug release from RDTs was studied by using USP type-II dissolution rate test apparatus at 50rpm (USP XXIII Dissolution Test Apparatus) using 900ml of phosphate buffer pH6.8 as dissolution medium. RDTs of desired formulation were taken and placed in the vessels of dissolution apparatus. Samples were collected from the vessels at different time intervals, replenished with same volume of the blank solution and analyzed using UV-Visible spectrophotometer. Drug concentration was calculated from the standard graph and expressed as % of drug dissolved or released. The release studies were performed in replicates and means values were taken.

Table 8: Details of *in vitro* drug release study

Apparatus used	USP XXIII dissolution test apparatus
Dissolution Medium	6.8 pH Phosphate buffer
Dissolution Medium Volume	900ml
Temperature	37±0.5ºC
Speed Of Paddle	50rpm
Time Intervals	2,5,10,15,30,45,60mins
Sample Withdrawn	5ml
Absorbance Maximum λ_{max}	224nm

Stability Studies:

Stability of a drug is defined as the ability of a particular formulation, in a specific container, to maintain its physical, chemical, therapeutic and toxicological specifications.

The purpose of stability testing is to provide evidence on how the quality of a drug substance varies with time under the influence of variety of environmental conditions and enables recommended storage conditions, re-test periods and shelf lives to be established.

RESULTS AND DISCUSSION:

1. Determination of absorption maximum λ_{max}

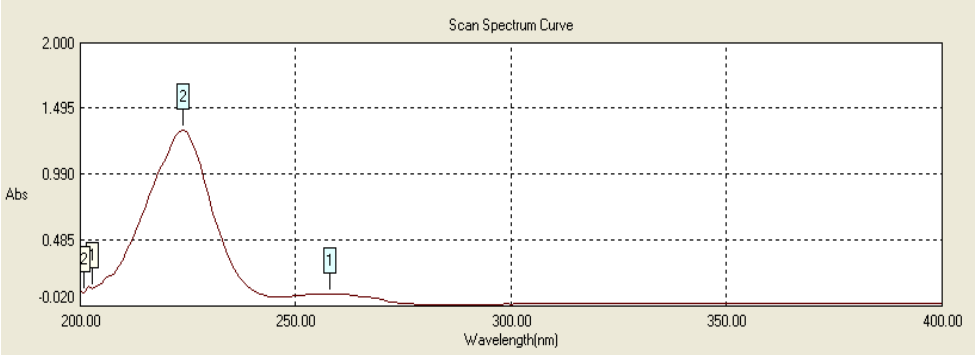

Fig 1:λ_{max} of Fexofenadine Hydrochloride in 6.8pH phosphate buffer

Table 9: Construction of standard calibration curve using 6.8 ph phosphate buffer:

S. No	Concentration (µg/ml)	Absorbance
1	10	0.151
2	20	0.341
3	30	0.522
4	40	0.765
5	50	0.950
6	60	1.138

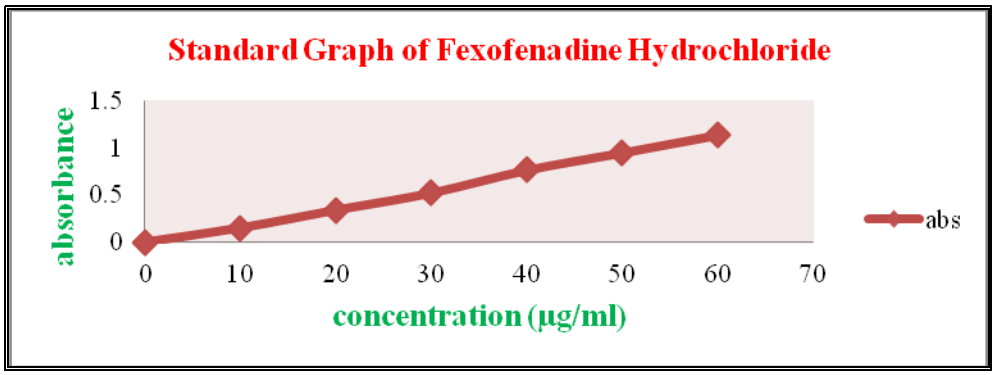

Fig 2: Standard graph of Fexofenadine Hydrochloride

3.Determination of solubility:

It was observed that it is sparingly soluble in water and chloroform, completely soluble in ethanol and methanol and insoluble in hexane.

4.**Determination of drug polymer compatibility studies using FTIR**:

Drug excipient interactions play a crucial role with respect to the stability and potency of the drug. FTIR techniques have been used to study the physical and chemical interaction between the drug and excipients used.

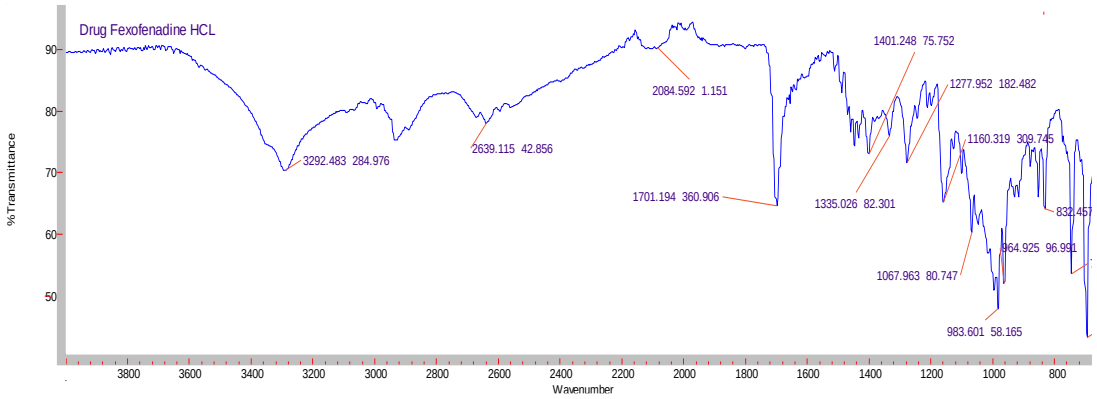

Fig 3:FT-IR spectra of Fexofenadine Hydrochloride

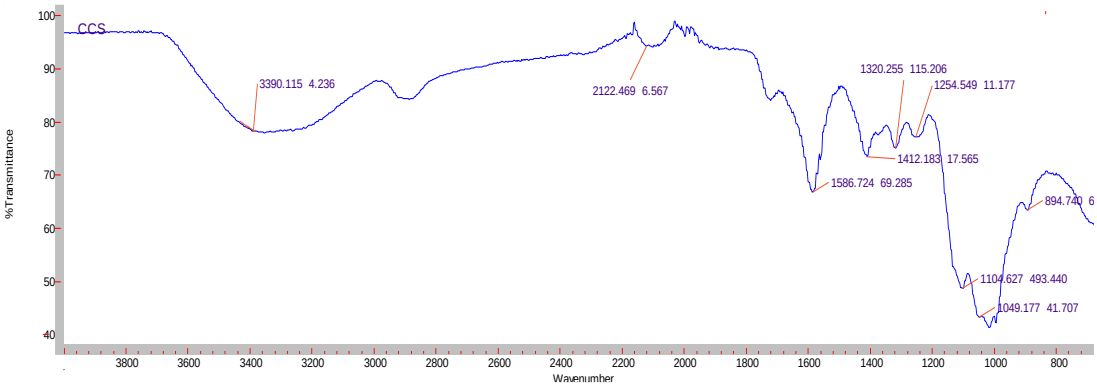

Fig 4: FT-IR spectra of Cross carmellose Sodium

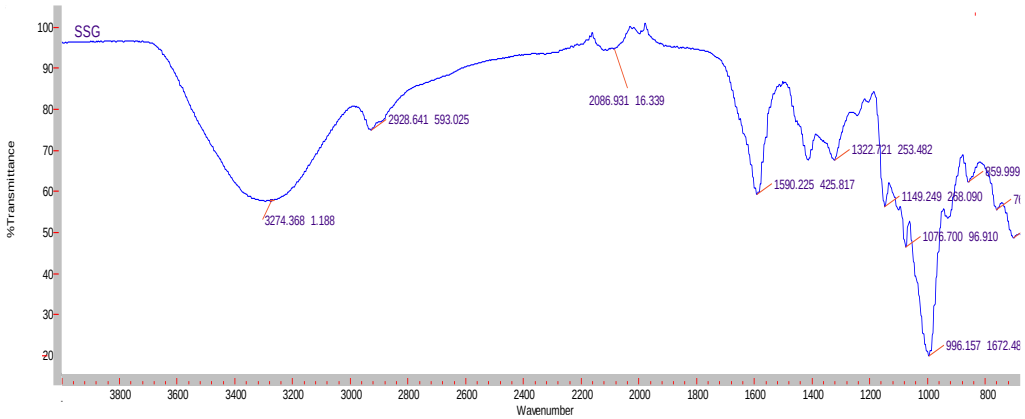

Fig 5: FT-IR spectra of Sodium Starch Glycolate

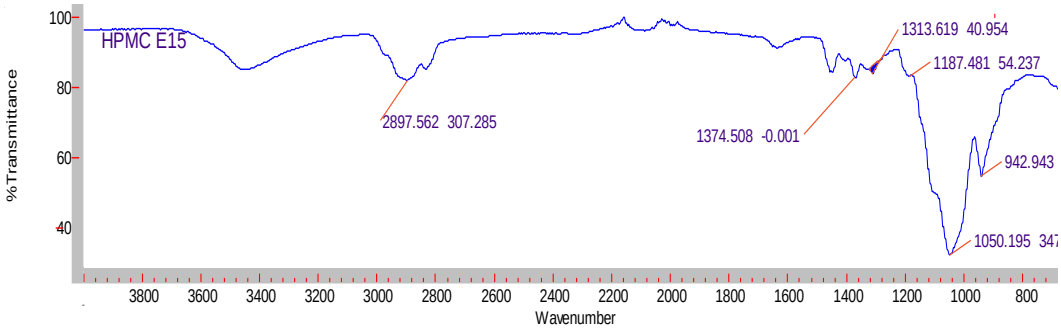

Fig 6:FT-IR spectra of HPMC E 15

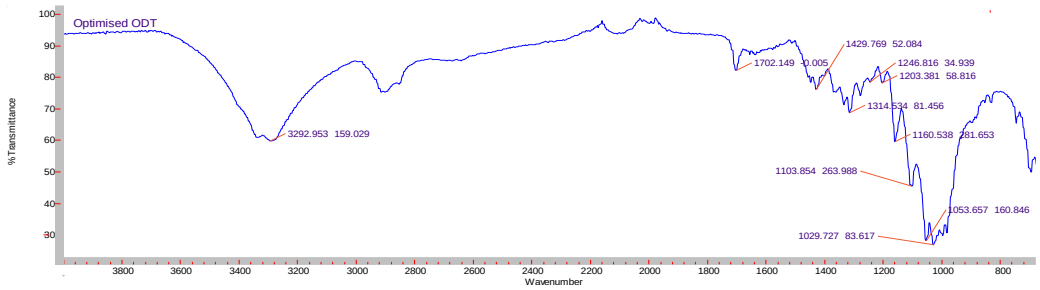

Fig 7:FT-IR spectra of optimized RDTof Fexofenadine Hydrochloride

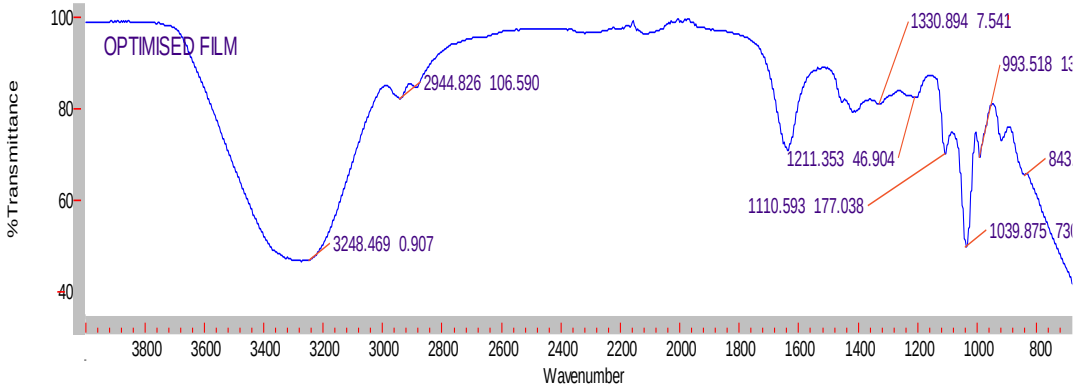

Fig 8:FT-IR spectra of optimized RDF of Fexofenadine Hydrochloride

Table 10: Pre-Compression Parameters:

S. No	Formul	Angle of repose (θ)	Bulk density (gm/cc)	Tapped density (gm/cc)	Carr's index (%)	Hausner's ratio
1	T1	21.43	0.65	0.72	10.22	1.11
2	T2	20.55	0.69	0.79	12.65	1.14
3	T3	21.45	0.69	0.81	14.81	1.17
4	T4	20.67	0.70	0.82	14.63	1.17
5	T5	20.84	0.64	0.72	11.11	1.12
6	T6	20.82	0.64	0.73	12.32	1.14
7	T7	22.29	0.65	0.74	12.16	1.13
8	T8	22.32	0.71	0.83	14.45	1.16
9	T9	21.27	0.70	0.80	12.50	1.14

Evaluation of the flow properties of powder blend for formulations T-1 to T-9

Table 11: Post Compression Studies:

S. No	Formulations	*Weight variation (mg)	*Thickness (mm)	*Hardness (kg/cm^2)	Friability (%)
1	T1	99.10±0.20	2.38±0.03	2.56±0.13	0.45
2	T2	101.09±0.33	2.47±0.01	2.52±0.11	0.53
3	T3	101.80±0.34	2.5±0.02	3.46±0.25	0.49
4	T4	100.33±0.76	2.46±0.04	3.32±0.21	0.57
5	T5	100.34±0.48	2.38±0.12	2.91±0.15	0.68
6	T6	101.67±0.27	2.5±0.02	2.96±0.17	0.62
7	T7	100.43±0.71	2.33±0.14	3.46±0.25	0.51
8	T8	100.19±0.21	2.5±0.02	3.05±0.21	0.63
9	T9	99.26±0.20	2.4±0.02	3.04±0.21	0.65

*Values expressed as mean±SD, n=3

Table 12: Evaluation of tablets for weight variation, thickness, hardness and friability (T-1 to T-9)

S. No	**Formulations**	**Disintegration time (sec)**	**Wetting time (sec)**	**Water absorption ratio**
1	T1	22	20	109
2	T2	18	18	100
3	T3	10	8	96
4	T4	38	36	97
5	T5	26	23	87
6	T6	19	22	107
7	T7	60	57	108
8	T8	55	50	99
9	T9	30	25	95

Table 13: Evaluation of the disintegration time, wetting time and water absorption ratios of prepared tablets (T1-T9)

Time (min)	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**	**T9**
2	30.67	43.65	**60.36**	64.05	69.02	70.15	33.12	48.85	56.3
5	39.15	58.05	**79.2**	71.95	73.15	82.05	46.24	57.75	61.4
10	60.9	76.95	**100.98**	74.4	86.75	86.62	66.1	70.11	74.65
15	77.06	87.15		87.95	91.85	90.22	74.94	79.21	79.7
30	94.23	96.5		96.45	98.6	99.01	96.8	98.57	99.9
45	98.35	99.65		101.0	101.15	110.35	100.4	110.15	101.3
60	98.84	102.3		-	105.2	-	-	-	-

Percentage Cumulative drug release of T-1 to T-9

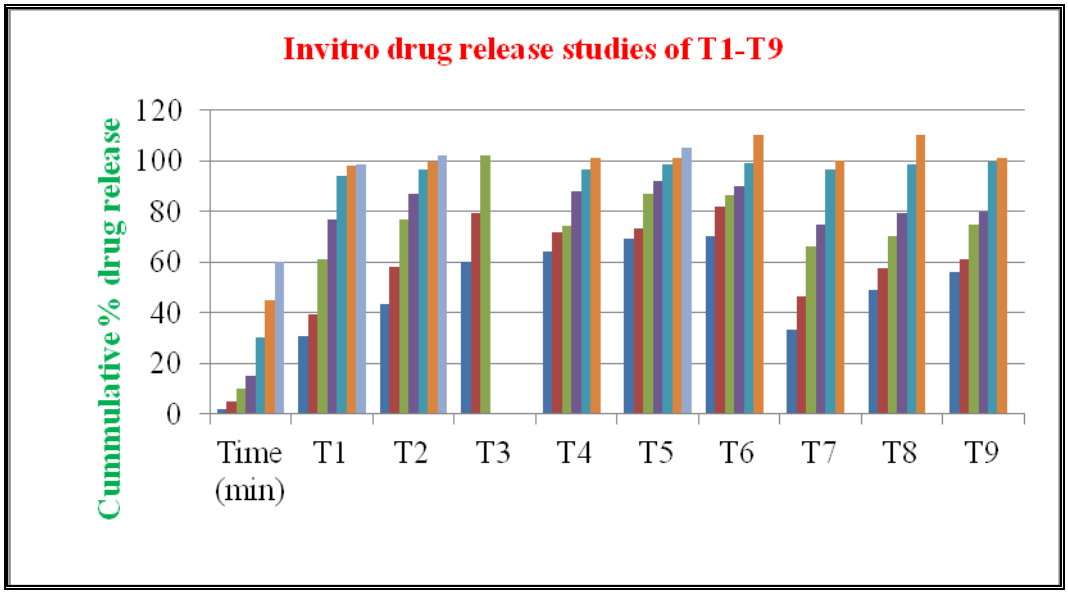

Fig 9: Cumulative percentage drug release of T1-T9

Table 14: Accelerated Stability Studies: Accelerated Stability Study data of Optimized Formulation

Stability Period	% Drug Content	% In vitro Release
Initial	98±0.05	100±0.01
30 Days	97±0.86	99±0.24
60 Days	97±0.64	99±0.18
90 Days	97±0.02	99±0.05

*Values expressed as mean±SD, n=3

Table 15: FT-IR data interpretation

S. no	Formulations	Wave number in formulation (cm^{-1})	Characteristic wave number range(cm^{-1})	Bond nature and bond attributed
1	Pure drug	3292.48	3200-3400	NH stretching (2° amine)
2	CCS	1586.72	1400-1600	C=C ring stretch Benzene
3	SSG	3274.36	3200-3400	OH stretching (Bonded)
4	HPMC E 15	2897.56	2800-3000	C-H aldehyde stretching
5	Optimized Tablet	1702.14	1600-1800	C=O ketone stretching
6	Optimized Film	1039.87	1020-1250	C-N aliphatic stretching

Oral disintegrating drug delivery system have an advantage over the conventional drug delivery system in pediatric, elderly, bed ridden, mentally retarted and patients suffering with dysphagia. As these kind of patients need special attention and monitoring, in the present study an attempt has been made to formulate and evaluate Rapid Dispersible Tablets tablets and films of Fexofenadine Hydrochloride by Direct Compression method using different superdisintegrants in different concentrations and combinations and Solvent Casting method using different polymers in different concentrations respectively. Different formulations of tablets and films were prepared and then characterized for various physico-chemical properties.

Preformulation Studies:

Solubility: The solubility of Fexofenadine Hydrochloride reveals that it is sparingly soluble in water and chloroform, completely soluble in ethanol and methanol and insoluble in hexane.

Determination of λ_{max}: In the Preformulation studies, the lambda max of Fexofenadine

Hydrochloride was determined by Spectroscopic Method and it was found to be 224nm with 6.8pH phosphate buffer.

Construction of calibration curve: In this study at 224nm in 6.8pH phosphate buffer had good reproducibility in the concentration between 10-50µg/ml. Correlation between concentration and absorbance was found to be closer to 1 indicating that the method obeyed Beer-Lambert's Law.

Drug polymer compatibility studies: Fourier-Transformed Infrared (FTIR) Spectrophotometer technique has been used to study the physical and chemical interaction between the drug and excipients used.

The FT-IR spectrum of pure drug an different excipients and the optimized tablet and film formulation were studied and tabulated in .There was no significant difference between the absorption peaks of pure drug and optimized formulation. The results concluded that there was no interaction between pure drug and excipients.

Pre-Compression Parameters:

Angle of repose: The angle of repose for the formulation blend was carried out and the results were shown. It can be concluded that the angle of repose for all formulation blends was obtained in the range of 20.02 to 22.32 thus falling in the range of official limits 25-30 (good flow). Hence all formulation blends possess good flow property.

Bulk density: Bulk density of the formulation blend plays an important role in the compression of the powder. Bulk density was carried out and the results were shown in the table.The bulk density of the formulations was found to be in the range of 0.64g/cm^3 to 0.71g/cm^3.

Tapped density: Tapped density also plays an important role in knowing the compressibility of the formulation blend. It was found to be in the range of 0.72g/cm^3 to 0.83g/cm^3. It was noted that the tapped density of all the formulations were greater than their respective bulk density thus indicating that all the powder formulation had a good compressibility. (Table no)

Carr's compressibility index: Carr's consolidation index was carried out and the results were shown in the tables. The CCI was calculated based on bulk density and tapped density. It was found to be in the range of 10.22 to 14.81 indicating that all formulation blends possess good flow property for compression.

Hausner's Ratio: Hausner's ratio is the ratio between tapped bulk density and loose bulk density. Hausner's ratio was calculated for all formulation blends and reported in the Table . All formulations having Hausner's ratio < 1.25

Evaluation of Post Compression Parameters of Tablets

Weight variation : The % weight variation was calculated for all formulations. All the formulations passed the weight variation test as the percentage weight variation was within the pharmacopoeia limits. The weights of all formulations were found to be uniform with low standard deviation values

Thickness: Thickness of all the formulations was found to be 2.33±0.14 to 2.52±0.03mm with low standard deviation values

Hardness: The crushing strength of the uncoated tablets of each batch ranged between 2.52±0.11 to 3.46±0.25 kg/cm^2. This ensures good handling characteristics of all batches

Friability: The values of friability test were in the range from 0.45 to 0.69%. The percent friability of all the formulations was less than 1% ensuring that the tablets were stable.

Disintegration Time: The values of the disintegration time found in the range 10 to 60 seconds.T3 formulation was found to have less disintegration.

Water absorption ratio: The formulations prepared shows water absorption ratio in the range 87-109%, formulations containing less superdisintegrant shows lower water absorption ratio when compared formulations containing more superdisintegrants, the water absorption ratio also decreases due to less swelling property.

Wetting time: Wetting time is closely related to the inner structure of the tablet. Promising formulations T3 showed a wetting time of 8 which facilitates faster dispersion in the mouth.

In vitro drug release studies: The in vitro drug release study plays an important part in the selection of best formulation among all. The in vitro drug release study for tablets of Fexofenadine Hydrochloride was carried out in 6.8pH phosphate buffer as a diffusion medium. The drug release from the formulation increased as the concentration of the super disintegrant increased.

Stability Studies: The selected formulation was subjected to stability studies and the formulation was evaluated for physical parameters like size, colour, hardness, thicknesses were same. The percentage drug content and % cumulative drug release was tested at 30 days, 60 days and 90days.

CONCLUSION:

The objective of the present research work was to prepare intra oral rapid dispersible tablets and films of Fexofenadine Hydrochloride, as this drug has few negligible side affects formulating this drug into oral

disintegrating drug delivery system makes it superior and effective candidate for pediatric, geriatric, bedridden, psychotic patients and for those who are travelling and has no access to water.

The conclusion drawn from the present study is as follows:

- Preformulation studies of Fexofenadine Hydrochloride were performed, from the FT-IR, the interference was verified and found that Fexofenadine Hydrochloride did not interfere with the polymers used.
- Nine batches of rapid dispersible tablets of Fexofenadine Hydrochloride were successfully prepared using Cross Povidone, Cross carmellose Sodium and Sodium Starch Glycolate as Superdisintegrants in different concentrations and in different combinations by Direct Compression method.
- Based on the results, the formulation containing 10 % crospovidone (T3) was identified as ideal and better formulation among all formulations of Fexofenadine Hydrochloride.
- In vitro release of optimized formulation of Fexofenadine Hydrochloride rapid dispersible tablets of T-3 was found to be 100.98% drug release within 10 mins with in vitro diintegration time being 10secs.

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