Formulation and Evaluation of Fast Dissolving Tablet of Famotidine By Using Naturally obtained Super Disntigrant

Dharmendra Kumar Singh*, Vishal Singh

Sheat College Of Pharmacy, Varanasi

***Abstract*: Oral drug delivery has been regarded for many years as the most widely applied course of administration amongst all of the routes which have been explored for the systemic transport of medicine through various pharmaceutical merchandise of different dosage paperwork. The purpose that the oral route executed such recognition may be in element attributed to its ease of administration as well as the conventional notion that by oral administration the drug is as properly absorbed as the meals stuffs which might be ingested each day.**

In truth, the improvement of pharmaceutical products for oral transport, irrespective of bodily form entails varying extents of optimization of dosage form characteristics in the inherent constraints of GI physiology.

consequently, a fundamental understanding of various disciplines, together with GI body structure, Pharmacokinetics, Pharmacodynamic and method design are important to gain a systemic technique to a hit development of an oral pharmaceutical dosage shape. anyways, the clinical body paintings required for a success improvement of an oral drug delivery gadget consists of a simple expertise of the following three components: Physicochemical, pharmacokinetic and Pharmacodynamic characteristics of the drug.

***Keywords*: GI physiology, Pharmacokinetic,Physiochemical, Pharmacodynamic characteristic.**

INTRODUCTION

FAST DISSOLVING TABLETS:

A fast-dissolving tablets may be defined as a strong dosage shape that could disintegrates into smaller granules which slowly dissolve in the mouth. The disintegration time for fast dissolving pill varies from some seconds to extra than a minute relying on the method and the scale of the tablet.

A fast disintegrating or dissolving system or tablets may be described as a stable dosage shape which could fall apart or dissolve within 30 seconds, within the oral hollow space ensuing in an answer or suspension without administration of water. the quick-disintegrating drugs are synonymous with fast dissolving tablets; soften in mouth tablets, rapimelts, porous drugs, Orodispersible, quick dissolving or hastily disintegrating tablets.

ADVANTAGES OF FAST DISSOLVING TABLETS:

- Rapid onset of drug therapy.
- Achieve increased bioavailability/rapid absorption through GIT.
- Good mouth feel property helps to change the perception of medication as bitter pillparticularly in pediatric patients.
- Convenient for administration and shows better patient compliance. The risk of chockingor suffocation during oral administration of conventional formulations due to physicalobstruction is avoided, thus providing improved safety.
- Fast onset of action.
- No need to swallow tablet.
- Good stomach and intestinal tolerance.
- More portability.
- Improved palatability.
- Superior stability.
- More consistent response.
- Incorporation of large amounts of activeingredients.
- Accurate Dosing.
- Improved Therapeutic Effect.
- In remote areas, especially where parenteralforms are not available due to prohibitive cost, lack of qualified medical staff, effervescent tablets could become an alternative.

Property Of Fast Dissolving Tablet:

- They should require no water for oral administration but it should disintegrate or dissolve in the mouth usually within fraction ofseconds.
- Theses dosage forms must have a pleasant mouth feel.

Must be compatible with taste masking and other Excipient.

- It should have sufficient strength to withstand the strain of the manufacturing process andpost manufacturing handling.
- It should leave negligible or no residue in mouth after oral administration.
- Exhibit low sensitivity to environmental conditions such as temperature and humidity.
- Should be adaptable and amenable to current processing and packaging machinery.

❖ Allow high drug loading.

Ingredients used in FDT formulation:

Excipient stability the stability of the actives in speedy-melting tablets. This demands a radical information of the chemistry of this Excipient to prevent interplay with the actives. figuring out the price of those elements is every other issue that needs to be addressed by using formulators. The function of excipient is vital in the method of speedy-melting drugs. these inactive meals-grade substances, when included in the formula, impart the preferred organoleptic properties and product efficacy. Excipient are standard and can be used for a huge range of actives, except some actives that require masking agents.

BULKING MATERIALS:

Bulking materials are large in the formula of speedy-melting tablets. The materials contributes functions of a diluents, filler and fee reducer. Bulking dealers improve the textural characteristics that in flip enhance the disintegration inside the mouth, besides; adding bulk additionally reduces the concentration of the active in the composition. The endorsed bulking dealers for this shipping device ought to be extra sugar-primarily based inclusive of Mannitol, polydextrose, lactitol, DCL (direct compressible lactose) and starch hydrolystate for better aqueous solubility and proper sensory belief. Mannitol specifically has excessive aqueous solubility and right sensory perception. Bulking marketers are brought within the variety of 10 percentage toabout ninety percentage via weight of the final composition.

EMULSIFYING AGENT:

Emulsifying agents are important excipient for formulating rapid-melting drugs they aid in speedy disintegration and drug launch without chewing, swallowing or ingesting water. further, incorporating emulsifying sellers is useful in stabilizing the immiscible blends and enhancing bioavailability. A wide variety of emulsifiers is suggested for instant-tablet components, which includes alkyl sulfates, propylene glycol esters, lecithin, sucrose esters and others. these marketers can be incorporated inside the range of zero.05 percentage to about 15 percentage by means of weight of the final composition.

LUBRICANTS: Lubricants, although no longer crucial excipient, can in addition help in making those tablets extra palatable once they crumble in the mouth. Lubricants eliminate grittiness and help within the drug shipping mechanism from the mouth down into the stomach.

FLAVOURS AND SWEETENERS:

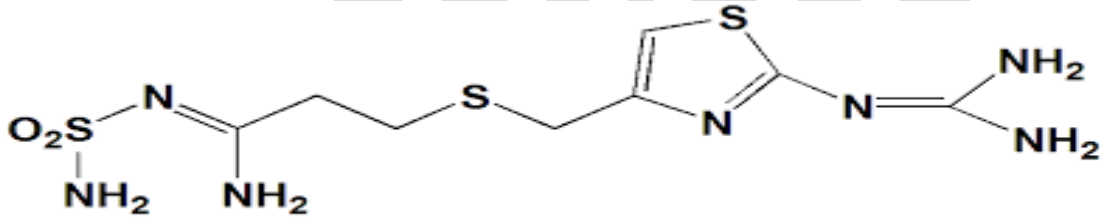
Flavours and flavor-masking retailers make the goods more palatable and eye-catching for sufferers. The addition of these elements assists in overcoming bitterness and undesirable tastes of a few active ingredients. each herbal and artificial flavours may be used to enhance the Organoleptic function of fast-melting capsules. Formulators can choose from a huge variety of sweeteners along with sugar, dextrose and fructose, in addition to non-nutritive sweeteners including aspartame, sodium saccharin, sugar alcohols and sucralose. The addition of sweeteners contributes a nice flavor as well as bulk to the composition.

SUPER DISINTEGRANTS:

A disintegrants is an excipient, that's added to a pill or pill blend to useful resource in the breakup of the compacted mass when it's miles placed into a fluid environment.

MATERIALS AND METHOD

Drug Profile



Famotidine

Synonyms 3-[[2-(diaminomethylideneamino)-1,3-thiazol-4-yl]methyl sulfanyl]- N'-methyl sulfonyl propan imidamide

Formula: - $C_8H_{15}N_7O_2S_3$

Molecular Mass: - 337.45 g/mol

Density: 1.8±0.1 g cm^3

Melting Point: - 163–164 ºC

Colour: - White

Odour: - Faint

Routes of Administration: - oral

Bioavailability 40-50%

Protein Biding:- 15-20 %

Metabolism:- Cytochrome P450,

Onset of Action:- 30–60 minutes

Excretion:- Renal

Half life:- 3 hours
Solubility: - 0.1% w/v
Storage condition:- Recommended storage temperature -20-30 °C

POLYMERS PROFILE

Introduction of polymer Used (seed mucilage of plantago ovata):

Plantago seed, psyllium seed or plantain seed which is cleaned, dried, ripe seed of Plantago psyllium or Plantago indica, belongs to family Plantaginaceae. The genus Plantago contains over 200 species. P. ovate and P. psyllium and P. indica are three important species.

these are produced commercially in several eu international locations, the former Soviet Union, Pakistan, and India. Isabgul, the commonplace name in India for P. ovata, comes from the Persian phrases isap and ghol that suggest horse ear, which describes the form of the seed. India dominates the world market in the production and export of psyllium. Plantago seeds contain 10 to 30% of hydrocolloid inside the outer seed coat which can be separated into acidic and neutral polysaccharides and upon hydrolysis L-arabinose, D-galactose, D-galacturonic acid; L-rhamnose and D-xylose are obtained.

answer of Plantago gum is thixotropic wherein as its mucilage has exceptional disintegrant property. The husk is the rosy-white membranous covering of the seed, which constitutes the drug, specifically given as a safe laxative, specially useful in ordinary constipation, persistent diarrhea and dysentery. it's far a 100% herbal product, a soluble fiber and paperwork gel in water. the usual dose of Plantago ovata is 7.5 g.

The underlying observe was carried out with the goal of giving a short review of things affecting cultivation, increase of Plantago ovata, and its pharmaceutical and pharmacological aspects to show its uses in various clinical fields.

Houses of polymer Used (seed mucilage of plantago ovata):

Numerous research were conducted in the beyond to observe both physical and chemical residences of Plantago ovata. examine of Fisher exhibited that it possesses 22.6% arabinose and 74.6% xylose with small quantity of other sugars. Likewise, Guo also investigated physicochemical residences of Psyllium gum. special collection of Psyllium gum fractions had been formulated by means of extracting Psyllium husk with hot water (80OC) and zero.five M NaOH, 1.2 M NaOH and a pair of.zero M NaOH answers, respectively.

these series of Psyllium gum fractions have been classified as water extractable (WE), zero.5 M alkali extractable (AES0.five), 1.2 M alkali extractable (AES1.2), and a couple of.0 M alkali extractable fractions. furthermore, to formulate soluble fraction (AES0.five) and a gel fraction (AEG0.5), the alkali extracted solutions were similarly neutralized with 0.five M HCl and centrifuged. Monosaccharide evaluation and methylation analysis became accomplished to study chemical ingredients of various fractions.

The monosaccharide evaluation discovered that WE, AEG and AES fractions of Psyllium gum contained xylose and arabinose as essential materials while uronic acid become located in WE and AES0.5 fractions in comparison with AEG 0.five, which most effective have some neutral sugars.

Methylation evaluation also showed that WE and AEG zero.5 particularly incorporate 1 fi 4) and 1 fi three) linked β-D-xylopyranosyl residues within the key chain while aspect-chains include of arabinose and xylose linked to the primary chain via O-3 and/ or O-2 linkage. The dietary fee and hint element content material of Plantago ovata turned into studied by Buksh and that they revealed that both Plantago ovata leaves and seeds possess package deal of crude fibers, proteins fats and carbohydrates.

Properties of Plantago ovata seed Mucilage:

Mucilage are maximum frequently used adjuvant in distinct pharmaceutical preparations because of their binding, disintegrating, emulsifying, movie forming, suspending and thickening properties. The mucilages had been received with the aid of simple maceration method and were similarly subjected to granule and tablet formation at distinct concentrations. That Plantago ovata own similar binding properties as that of starch and eight% to 9% attention confirmed desirable binding traits in uncoated capsules.

Disintegrants:

Superdisintegrants are materials added to tablets to help the breakup of compacted mass into particles, if you want to facilitate the discharge of energetic aspect and drug dissolution, whilst it procedures the fluid surroundings Plantago ovata is used as a superdisintegrant as a result of swelling characteristics of its mucilage. Disintegrants had been utilized in concentration of 5% w/w Plantago ovata. The pills formulated by using using Plantago ovata mucilage supplied amended drug dissolution and bioavailability as located by the results disintegration time and Plantago ovata mucilage, seed and husk powder, respectively

The have a look at divulged better disintegration properties of Plantago ovata mucilage because of highest swelling index. The tablets formulated with Plantago ovata confirmed shorter disintegration time as compared to drugs organized by using sodium starch glycolate and croscarmelose sodium. simply as, FDTs of famotidine were formulated in order to check out the results of various natural and artificial superdisintegrants and concluded that Plantago ovata husk powder provided superior drift houses, water retention and disintegration time than maize starch.

Gelling agent:

Sahay (1999) further elaborated using mucilage husk of Plantago ovata as an alternative jelling agent. in step with him, four% w/v

of ground husk changed into utilized in mixture with 0.5% w/v of agar media to promote microbial growth; however he had already removed unwanted properties of Psyllium-gelled media by using supplying UV treatment, oven sterilization and autoclaving.

suspending agent:

extraordinary research have been conducted to assess use of Plantago ovata as a suspending agent, due to its mucilage forming belongings. in step with Rajamanickam mucilages of various flora may be used to suspend particles in thermodynamically risky structures, which useful resource in preventing sedimentation of debris and promote easy dispersion of settled debris because of their viscous and colloidal nature. Bashir have remoted arabinoxylan from Plantago ovata seed husk by using alkali extraction and compared its houses as suspending agent with betonies by way of formulating 1% zinc oxide suspension. Arabinoxylan produced strong, exceptionally flocculated suspension, which fulfilled all particle length specifications and microbiological properties; consequently, it appreciated using arabinoxylan as effective postponing agent in ZnO suspension.

Plantagoovata Seed Mucilage: Ispaghula mucilage consists of epidermis of the dried seeds of Plantagoovata contains mucilage. Plantagoovata seed mucilage is acquired by way of grinding off the husk. Mucilage of Plantagoovata has traits like binding, disintegrating, and sustaining residences. rapid disintegrating drugs of prochlorperazine maleate have been formulated with use of PlantagoOvata (2-8% w/w) as superdisintegrant by using direct compression technique to improve the patient compliance.

Computational and compilational work.

The preformulation screening of Drug-Excipient interaction requires 5 mg of drug, in 50% mixture (1: 1) with Excipient, to maximize the likehood of observing an interaction.

Material Used

INGREDIENT	FORMULATION CODE			
	F1	F2	F3	F4
Famotidine	30 mg	30 mg	30 mg	30 mg
Planatgo ovata seeds	800 mg	700 mg	750 mg	1000 mg
Kyron T-314	30 mg	30 mg	30 mg	30mg
SSG	200 mg	300 mg	300 mg	300mg
Aerosil	60 mg	60 mg	60 mg	60mg
Mannitol	415 mg	415 mg	415 mg	415mg
Talc	50	50	50	50
Magnesium state	50	50	50	50

PRE-COMPRESSION STUDIES:

a) Angle of Repose.

b) Bulk density and tapped density.

c) Hausner's ratio.

d) Compressibility index (%)

a) Angle of repose (ɵ):

The angle of repose is indicative of flowability of the substance. Funnel was adjusted in such a manner that the stem of the funnel lies 2.5 cm above the horizontal floor. The pattern powder was allowed to go with the flow from the funnel, so the height of the pile simply touched the end of the funnel. The diameter of the pile was decided by way of drawing a boundary alongside the circumference of the pile and taking the common of three diameters. The attitude of repose is calculated by means of the following formulation:θ=tan-1h/r

Table 6: Angle of Repose

Sr. No.	Angle Of Repose	Quality
1.	<20	Excellent
2.	20-30	Good
3.	30-40	Passable
4.	>40	Very poor

Procedure: Weighed quantities of powder (mix blend) have been poured via the funnel from the constant peak onto the graph paper. the peak of the heap become measured. The circumference of the heap became marked via pencil. The vicinity of the circle shaped turned into calculated on the idea of large squares and small squares present within the circle and attitude of

repose changed into then calculated on the parameter "r" which become found out from the vicinity of circle.

b) Bulk density and Tapped density: each unfastened bulk density (LBD) and tapped bulk density (TBD) had been decided. A amount of as it should be weighed powder (bulk) from every components, formerly shaken to break any agglomerates shape changed into delivered right into a 25 ml measuring cylinder. After the preliminary quantity turned into determined, the cylinder become allowed to fall below its very own weight onto a difficult surface from the peak of two.5 cm at 2 2nd c programming language. The taping changed into persevered till no further trade in volume became stated. LBD and TBD had been calculated the use of following formula.

$$\text{LBD} = \frac{\text{Weight of powder}}{\text{Volume of packing}}$$

$$\text{TBD} = \frac{\text{weight of powder after tapping}}{\text{Volume of packing}}$$

c) Carr's compressibility index:

The Carr's Index is an indication of the compressibility of a powder. It is calculated by the formula:

Carr's index = (Tapped density- Bulk density) / Tapped density × 100

The Carr's Index is frequently used as an indication of the flowability of a powder. A Carr's Index greater than 25% is considered to be an indication of poor flowability and below 15% of good flowability.

Table 7: Compressibility Index

Sr. No.	% Compressibility Index	Properties
1.	5-12	Free flowig
2.	12-16	Good
3.	18-21	Fair
4.	23-35	Poor
5.	33-38	Very poor
6.	>40	Extremely

d) Hausner's Ratio:

The Hausner's Ratio is frequently used as an indication of the flowability of a powder. It indicates the flow properties of the granules and is measured by the ratio of tapped density to the bulk density.

$$\text{Hausner's Ratio} = \text{Tapped density/Bulk density}$$

Table 8: Hausner's Ratio

Sr. No.	Hausner's Ratio	Properties
1.	0-1.2	Free flowing
2.	1.2-1.6	Cohesive flowing

POST-COMPRESSION EVALUATION STUDIES:

Evaluations of Glimepiride mucoadhesive buccal tablets:

Compressed pills were subjected to diverse evaluation research, which blanketed thickness, difficult ness, drug content material uniformity, weight variation, friability, swelling index, mucoadhesive strength, in-vitro drug launch research, launch kinetics studies and stability studies.

Determination of weight variation: The weight of the tablet being made turned into automatically decided to ensure that a pill consists of the proper quantity of drug. The USP weight version take a look at is carried out by weighing 20 pills for my part, calculating the average weight and evaluating the character weights to the average. The capsules met the USP specification that now not greater than 2 drugs are out of doors the proportion limits and no pill differs by using more than 2 times the share restriction. USP legit limits of percent deviation of tablet are supplied inside the table nine.

Table 9: Limit of weight variation

Sr. No.	Average weight of tablet (mg)	Maximum % difference allowed
1.	130 or less	10
2.	130-324	7.5
3.	324<	5

Thickness of Tablets: Thickness of the tablet is important for uniformity of pill length. Thickness of every tablet became measured the use of Vernier Caliper. The average thickness of the tablet was calculated. The take a look at passed if none of the character thickness cost deviated via ± 5% of the average fee.

Hardness test:

The resistance of drugs to transport or breakage below situations of garage, transportation and managing before utilization depends on its hardness. The hardness of each batch of tablet changed into checked with the aid

of the use of Monsanto hardness tester. The tablet became placed vertically among the jaws of the tester. the two jaws positioned below tension with the aid of spring and screw guage. through turning the screw, the burden changed into multiplied and at crumble the applied strain from the spring became measured in Kg/cm2.

Determination of Friability: Friability typically refers to loss in weight of drugs in the bins due to removal of fines from the tablet floor. Friability generally reflects terrible cohesion of pill components.

Technique:20 tablets have been weighed and the initial weight of those tablets was recorded and positioned in Roche friabilator and circled at the velocity of 25 rpm for 100 revolutions. Then pills have been removed from the friabilator dusted off the fines and again weighed and the burden turned into recorded.percent friability turned into calculated via the usage of the formula:

$$\% \text{ Friability} = \frac{\text{Initial weight of the tablets} - \text{Final weight of the tablets}}{\text{Initial weight of the tablets}} \times 100$$

A maximum loss of weight (from a single test or from the average of the three tests) not greater than 1.0 % is acceptable for most tablets.

Drug content estimation:

20 drugs have been weighed from every batch and average weight is calculated. All drugs had been crushed and powder equivalent to 10 mg drug changed into dissolved in 6.eight pH phosphate buffer and the volume turned into made up to a hundred ml with identical solvent. From the inventory answer, 1ml solution changed into taken in 10 ml volumetric flask and the extent was made with 6.eight pH phosphate buffer. answer become filtered and absorbance turned into measured spectrophotometrically at 227 nm against 6.8 pH phosphate buffer as a clean. quantity of drug found in a pill turned into calculated.

Swelling studies:

For the dedication of swelling index (SI), tablets have been weighed and fixed onto 2×2 cm glass slides, which had been then immersed in Petri dishes containing 10 ml of PBS (pH 6.eight) medium. Temperature turned into kept steady at 37°C±0.five°C during the examine. After predetermined instances, drugs had been removed, and the extra surface water was wiped with clear out papers. Swollen capsules had been carefully reweighed, and SI was calculated.**SI (%) = (W_t -W_0)/ W_0 ×100**

Where W_t is the swollen tablet weight at a given time, W_0 is the tablet weight obtained initially. All experiments were performed in triplicate.

Surface pH study: Surface pH studies had been done so as to analyze the opportunity of any aspect consequences. This has to be studied because the alkaline or acidic pH irritates buccal mucosa. The tablet become allowed to swell via preserving in touch with 1ml distilled water in a Petridish for two hours at room temperature. The pH become recognized by bringing the electrode into contact with pill surface and allowing the surface to equilibrate for 1 minute.66

In-vitro drug release study: In-vitro drug release research had been decided by using in-vitro dissolution take a look at. The in-vitro dissolution studies have been done the usage of the USP-II (Paddle) dissolution apparatus the use of 900 ml of 6.eight pH phosphate buffer at a temperature of 37 ± 0.5ºC at 50 rpm. 5 ml of sample become accrued up to 12 hours and the same volume of clean media turned into replenished. The drug content inside the samples become predicted the usage of UV seen spectrophotometer at 227 nm.percent cumulative drug release become calculated and graph become acquired by way of plotting cumulative percentage drug launch VS time.67-68

Table 10: Detailsof *in-vitro*dissolution test

Dissolution test apparatus	USP type II
Speed	50 rpm
Stirrer	Paddle type
Volume of medium	900 ml
Volume withdrawn	5 ml
Medium used	6.8 pH phosphate buffer
Temperature	37±0.5ºC
Duration	12 hours

Determination of release kinetic studies:

The analysis of drug release mechanism from a pharmaceutical dosage form is important but complicated process and is practically evident in the case of matrix systems. The order of drug release from buccal tablets can be described by using zero order kinetics or first order kinetics. The mechanism of drug release from buccal tablets can be studied by using Higuchi equation and the Peppa's Korsemeyer equation.

a) Zero order kinetics:

When the data is plotted as cumulative % drug release versus time, if the plot is linear then the data obeys zero- order release Kinetics, with a slope equal to K^0.

Zero order release would be predicted by the following equation:-

$$A_t = A_0 - K_0 t$$

Where,

A_t= Drug release at time 't'.

A_0= Initial drug concentration.

K_0=Zero-order rate constant (hr^{-1}).

b) First order Kinetics:

When the data is plotted as log cumulative % drug remaining versus time yields a straight line, indicating that the release follows first order kinetics. The constant 'K' can be obtained by multiplying 2.303 with the slope values.

First order release would be predicted by the following equation:-

$$\textbf{Log C = log } C_0 - K_t / 2.303$$

Where,

C = Amount of drug remained at time 't'.

C_0 = Initial concentration of drug.

K = First-order rate constant (hr^{-1}).

c) Higuchi's model:

When the data is plotted as cumulative drug release versus square root of time, yields a straight line, indicating that the drug was released by diffusion mechanism. The slope is equal to 'K'. Drug release from the formulation by diffusion has been described by following Higuchi's classical diffusion equation:

$$Q = [D_\varepsilon / \varepsilon (2A - \varepsilon C_S) C_S t]^{1/2}$$

Where,

Q = Amount of drug released at time't'.

D = Diffusion co-efficient of the drug in the matrix.

A = Total amount of drug in unit volume of matrix.

C_S = Solubility of the drug in the matrix.

ε = Porosity of the matrix.

t = Tortuosity.

d) Korsmeyer equation/ Peppa's model:

When the data is plotted as log of drug released versus time, yields a straight line with a slope equal to 'n' and the 'K' can be obtained from y- intercept. To study the mechanism of drug release, the release data were also fitted to the well-known exponential equation (Korsmeyer equation/ Peppa's law equation), which is often used to describe the drug release behavior from polymeric systems.

$$M_t / M_a = Kt^n$$

Where,

M_t / M_a = the fraction of drug released at time't'.

K=Constant incorporating the structural and geometrical characteristics of the drug/polymer.

n = Diffusion exponent related to the mechanism of the release.

Above equation can be simplified by applying log on both sides,

$$\text{Log } M_t / M_a = \text{Log } K + n \log t$$

For Fickian release 'n' = 0.5 while for anomalous (non- Fickian) transport 'n' ranges between 0.5 and 1.0.

Table 11: Mechanism of Drug Release as per Korsmeyer Equation/ Peppa's Model

Sr. O.	'n' value	Drug release mechanism	Rate as a function of time
1.	0.45	Fickian release	$t^{-0.5}$
2.	0.45 <n = 0.89	Non- Fickian transport	t^{n-1}
3.	0.89	Class II transport	Zero order release
4.	Higher than 0.89	Super case II transport	t^{n-1}

Stability studies:

stability studies are finished to apprehend how to layout a product and its packaging such that product has suitable bodily, chemical and microbiological residences for the duration of a defined shelf life whilst stored and used.

Storage Condition:

The optimized batches of Glimepiride mucoadhesive buccal pills were subjected for 3 month stability studyas according to ICH guidelines.the selected formulationswere positioned in a extensive mouth glass bottles, mouth of the bottle become tightlyclosed and packed in aluminum foils.in the gift have a look at, balance research had been completed at 25ºC/60% and 40ºC/75% RH for a specific duration of 3 months for the chosen formulations. prepared tablets were evaluated for drug content material and in-vitro drug release profile.

Table 12: Storage conditions as per ICH guidelines

Sr. No.	Study	Storage Condition	Minimum period of time
1.	**Long term**	25ºC ±2 ºC/60%RH±5%RH 30 ºC±2 ºC/65%RH±5%RH	12 Months
2.	**Intermediate**	30 ºC±2 ºC/65%RH±5%RH	6 Months
3.	**Accelerated**	40 ºC±2 ºC/67%RH±5%RH	6 Months

RESULTS AND DISCUSSION

In the present investigation, FDT of famotidine were prepared by using synthetic superdisintegrants such as crosspovidone, cross carmellose sodium and sodium starch glycolate. **Identification of pure drug**

CALIBRATION CURVE OF FAMOTIDINE:

The absorbance of the prepared stock solutions was measured at 266 nm in an UV spectrophotometer. Plot agraph between

concentration (in µ g/ml) vs absorbance (in nm) on X-axis and Y-axis respectively.

Table 1: Calibration curve of Famotidine

S.no.	Concentration(in µg/ml)	Absorbance (in nm)
1.	0	0.000
2.	5	0.123
3.	10	0.233
4.	15	0.369
5.	20	0.497
6.	25	0.621
Slope	0.0247	
R^2	0.9992	

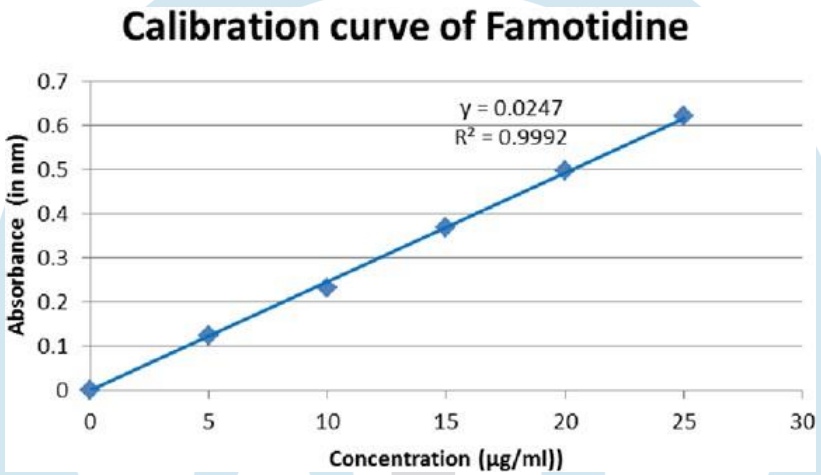


Fig.no.1. Calibration curve of Famotidine

Preformulation studies:

Organoleptic properties: The tests were performed as per the procedure. The results were tabulated below.

Table 3: organoleptic properties

Test	Specifications/limits	Observations
Colour	White to pale yellow	White powder
odour	Odourless	Odourless

The result complies as per specifications.

Physical properties:

Angle of repose:

It was determined as per procedure. The results were tabulated below.

Table 4: flow properties

Material	Angle of repose
Famotidine	27.14^0

The results show that the drug having poor flow.

Bulk density and tapped density:

It was determined as per procedure. The results were tabulated below.

Table 5: bulk density and tapped density

Material	Bulk density(gm/ml)	Tapped density(gm/ml)
Famotidine	0.48	0.44

Powder compressibility:

It was determined as per procedure. The results were tabulated below.

Table 6: powder compressibility

Material	Compressibility index	Hausner's ratio
Famotidine	11.27	1.44

Melting point:

It was determined as per procedure. The results were tabulated below.

Table 7: Melting point

Material	Melting point range	Result
Famotidine	163.5 ° C	163 ^{0}c

The result indicates that the Famotidine drug was pure one.

SOLUTION PROPERTIES

P^H of the solution:

It was determined as per procedure. The results were tabulated below.

Table 8: P^H of the solution

Material	Test	Specification	observation
Famotidine	P^H	5-6(1% aqueous solution)	6.22

The result indicates that the Famotidine drug was pure one.

Solubility:

It was determined as per procedure. The results were tabulated below.

Table 9: Solubility

Material	Test	Specification	observation
Famotidine	Solubility	Freely soluble in glacial acetic acid, slightly soluble in methanol, very slightly soluble inwater, and practically insoluble in ethanol.	Complies

EVALUATION OF FAMOTIDINE TABLETS

Table 12: weight variation and friability

Batch no.	Weight variation	Friability	Content uniformity
F1	+ 1.52	0.23	99.65
F2	±2.37	0.34	99.74
F3	+ 1.87	0.21	98.34
F4	+ 1.41	0.27	99.44
F5	±1.86	0.18	100.38
F6	±2.56	0.28	99.96
F7	+2.35	0.29	99.47
F8	±1.93	0.19	99.35

THICKNESS AND HARDNESS:

Table 13: Thickness and hardness

Batch no.	Thickness(mm)	Hardness(kg/cm^2)
F1	5.2±0.01	6.2
F2	5.1+0.02	7.1
F3	5.3+0.01	6.5
F4	5.1±0.03	6.9

F5	5.2+0.01	6.3
F6	5.3+0.04	7.2
F7	5.5±0.01	7.5
F8	5.3+0.01	6.4

Evaluation of granules:

Table 11: showing results of angle of repose, bulk and tapped density, Carr's index, hausner ratio

Batch no.	Angle of repose (^{0})	Bulk density (gm/ml)	Tapped density (gm/ml)	Carr's index (%)	Hausner ratio
F1	26 ° 32'	0.2891	0.3503	14.04	1.21
F2	24° 64'	0.2845	0.3394	15.68	1.22
F3	28° 59'	0.2924	0.3349	11.94	1.13
F4	26°12'	0.2875	0.3446	13.96	1.16
F5	23° 62'	0.2862	0.3420	15.13	1.19
F6	24°74'	0.2677	0.3214	13.92	1.15
F7	24 ° 77'	0.2743	0.3242	15.42	1.19
F8	26 ° 56'	0.2847	0.3177	10.38	1.11

EVALUATION OF FAMOTIDINE TABLETS

Table 12: weight variation and friability

Batch no.	Weight variation	Friability	Content uniformity
F1	+ 1.52	0.23	99.65
F2	±2.37	0.34	99.74
F3	+ 1.87	0.21	98.34
F4	+ 1.41	0.27	99.44
F5	±1.86	0.18	100.38
F6	±2.56	0.28	99.96
F7	+2.35	0.29	99.47
F8	±1.93	0.19	99.35

THICKNESS AND HARDNESS:

Table 13: Thickness and hardness

Batch no.	Thickness(mm)	Hardness(kg/cm^2)
F1	5.2±0.01	6.2
F2	5.1+0.02	7.1
F3	5.3+0.01	6.5
F4	5.1±0.03	6.9
F5	5.2+0.01	6.3
F6	5.3+0.04	7.2
F7	5.5±0.01	7.5
F8	5.3+0.01	6.4

Physically characterization studies stated that famotidine is white to light yellow crystalline powder with bitter taste. The melting point of famotidine was discovered to be within the variety of 162–164 °C when examined using capillary method in melting factor equipment in triplicate, which complies with the same old values inside the respectable monograph as in line with USP-NF. It was found that famotidine is nearly insoluble in water, however soluble in natural solvents like acetone, glacial acetic acid.

identification of the drug become performed from absorption maxima, IR and DCS studies. Absorption maxima of 265 nm confirmed that the drug become pure famotidine because it became previously mentioned in related literature. The spectra have been recorded for natural drug famotidine proven in fig. 1.

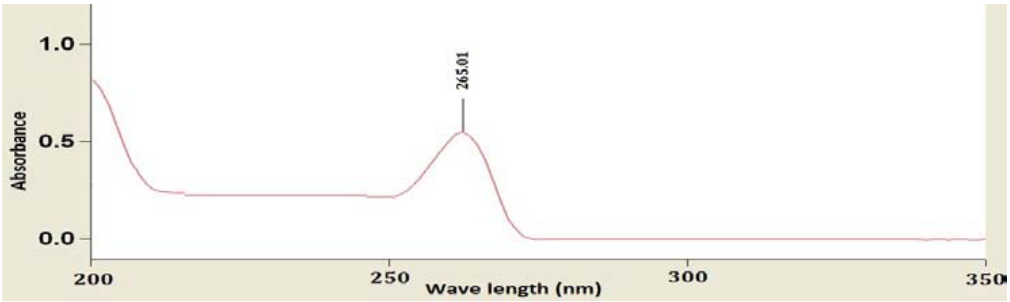


Fig. 1: Spectrometric graph of famotidine pure drug

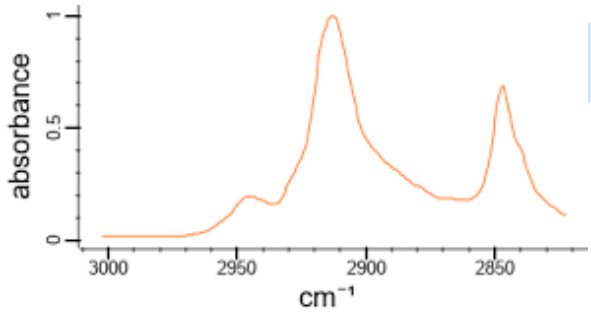


Fig. 1: FTIR graph of Magnesium state

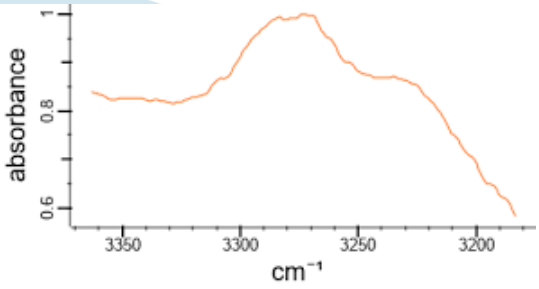


Fig. 1: FTIR graph of Mannitol

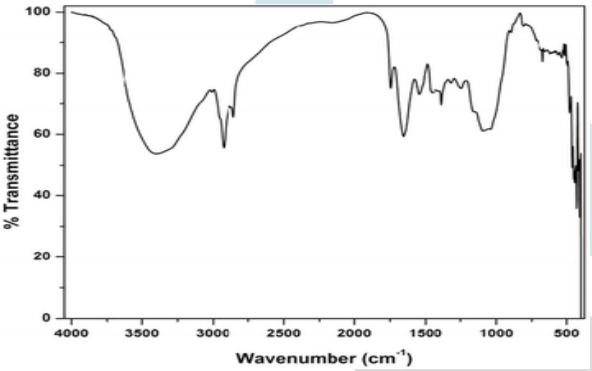


Fig. 1: **FTIR-spectrum-of-Plantago-ovata-seed-powder**

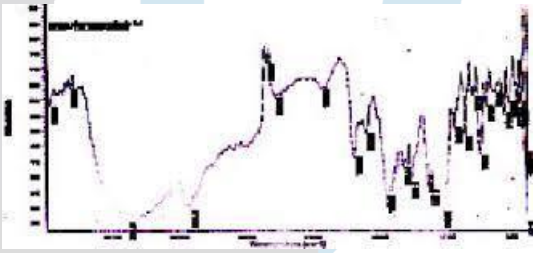


Fig. 1: **FTIR spectrum of SSG**

Evaluation of pre-compression studies

Direct compression approach became used for the instruction of the FDT. waft traits of the fabric being compressed are vital parameters and as a result research have been undertaken for the assessment of flow characteristics of the lubricated blend used in the gift have a look at. The results of flow houses of the prepared lubricated blends are proven in table 2. because the perspective of repose values have been inside the variety of 21.08° to 27.15° for F1 to F9 formulations respectively, which indicates notable to exact drift houses. The compressibility index of all the formulations had been inside the variety of 11.17–14.56 % respectively, with excellent compressibility index as all of the values are within 15 % effects in top to exceptional drift homes and which describes the frictional and cohesive interactions of the polymers within the components. Hausner's ratio of all the formulations turned into inside the range of 1.12 to 1.24 which indicated precise float traits for the organized lubricated blends, as all the values are <1.25 indicating the polymers with low interparticle friction.

Table 2: Pre-compression properties of prepared formulations Formulation

code	Angle of repose	Bulk density (gm/cm3)	Tapped density (gm/cm3)	Carr's index	Hausner's ratio
F1	26.25±0.64	0.39±0.03	0.46±0.24	13.21	1.17
F2	25.41±0.48	0.39±0.12	0.47±0.19	12.02	1.20
F3	22.73±0.46	0.38±0.09	0.46±0.24	14.56	1.24

F4	26.76±0.32	0.37±0.17	0.45±0.12	11.55	1.18
F5	22.14±0.66	0.38±0.15	0.41±0.14	13.75	1.10
F6	21.84±0.89	0.40±0.16	0.45±0.16	11.17	1.12
F7	27.15±0.42	0.38±0.12	0.46±0.21	12.13	1.24
F8	22.21±0.36	0.37±0.16	0.47±0.18	13.17	1.12
F9	21.08±0.32	0.36±0.14	0.43±0.12	14.13	1.23

evaluation of post-compression parameters Tableting traits of the famotidine FDTs organized drugs had been evaluated for weight version, hardness, friability, wetting time, water absorption ratio, disintegration time and assay and consequences are given in table 3 and 4.

all the prepared famotidine FDT are extra than 100 mg and are properly within the range of 5 % and subsequently qualify the take a look at for uniformity of weight. The thickness of all the formulations become in the range of zero.83 to zero.98 mm and hardness of all of the formulations changed into in the range of three to four kg/cm2. the percentage weight loss in the friability test became located to be less than zero.five % for all the batches.

The wetting time of all of the formulations was inside the range of 37 to 45 sec. The water absorption ratio of all the formulations become in the variety of 83.2 to 99.6 sec. The disintegration time of all the formulations became inside the range of eighty five-120 sec. Assay turned into observed to be in the variety of 98.94 to a hundred and one.29 % of the said quantity of famotidine. for this reason, famotidine FDT prepared with the selected superdisintegrants have been seemed as exact quality enjoyable the authentic and different requirements of tablets.

Table 3: Physicochemical properties of the famotidine FDT

S. No.	Weight variation (kg/cm2)*	Thickness (mm)**	Hardness (kg/cm2)**	Friability (%)***
F1	100.08±0.11	0.83±0.14	3-4	0.39
F2	101.07±0.12	0.98±0.16	3-4	0.42
F3	100.17±0.14	0.92±0.18	3-4	0.38
F4	100.97±0.13	0.91±0.24	3-4	0.45
F5	100.83±0.12	0.86±0.23	3-4	0.37
F6	101.01±0.11	0.9240.15	3-4	0.35
F7	100.95±0.14	0.91±0.18	3-4	0.42
F8	100.21±0.12	0.89±0.22	3-4	0.40
F9	101.01±0.18	0.93±0.15	3-4	0.35

Values are expressed as mean±SD where * n=20; **n=5; ***n≈6.5 gm of total weight.

Table4:Physicoch mical properties of the famotidine FDT

S. No.	Wetting time (sec)*	Water absorption ratio (%)*	Disintegration time (sec)*	Drug content (%)**
F1	39±0.14	87.9±0.41	108±1.61	99.86±0.14
F2	38±0.16	89.6±0.25	101±1.24	99.71±0.40
F3	41±0.18	96.2±0.18	95±1.22	98.94±0.68
F4	39±0.12	95.6±0.29	85±1.44	100.07±0.12
F5	43±0.22	96.8±0.36	120±1.35	99.88±0.43
F6	37±0.19	99.5±0.15	101±1.32	100.16±0.15
F7	45±0.22	83.2±0.24	116±1.06	99.27±0.48
F8	39±0.15	98.7±0.39	91±1.03	101.29±0.11
F9	37±0.19	99.6±0.43	107±1.32	100.15±0.13

Values are expressed as mean±SD where * n=3; **n =10.

DISCUSSION

The weight variation of the above pills are within the range of + 1.23 to a few.09 %(underneath five%) complying with the

pharmacopeial requirements. The friability of the pills are in the variety of zero.18 % to zero.34% (under 1%) complying with the pharmacopeial standards. The content uniformity of the capsules are within the variety of 99.37 to one hundred.38% complying with the pharmacopeial standards.

The thickness of the formulations was discovered to be inside the variety of 5.1+zero.01 to five.5+0.01 mm.

The hardness of the tablets became discovered to be inside the range of 6.2 to 7.five kg/cm2 indiacting a exceptional mechanical power.

The perspective of repose for the formulations F1-F8 turned into determined to be within the range 230.62' to 280.59' indicates desirable go with the flow. Compressibility index for the formulations F1-F8 observed between 10.38% to fifteen.6% indicating that the mixture has accurate go with the flow property for compression.

The weight variation of the above drugs are inside the variety of + 1.23 to 3.09 %(beneath 5%) complying with the pharmacopeial standards. The friability of the pills are in the range of 0.18 % to zero.34% (below 1%) complying with the pharmacopeial standards.

The content material uniformity of the capsules are inside the variety of ninety nine.37 to a hundred.38% complying with the pharmacopeial requirements.

The thickness of the formulations was discovered to be within the range of five.1+0.01 to 5.five+0.01 mm.

The hardness of the pills turned into discovered to be in the range of 6.2 to 7.five kg/cm2 indicating a great mechanical strength.

CONCLUSION

Hence, components organized with 6 % w/w of crosspovidine and forty four % w/w of microcrystalline cellulose as emerged as the overall excellent components (>90 % within 30 min) as compared to marketed product (>70 % inside 30 min). brief-time period balance research at the formulations ndicated that there aren't any big adjustments n drug content and n vitro drug launch (p<zero.05).

the existing examine was completed to expand the fast dissolving capsules of famotidine through the usage of numerous superdisintegrants at different ratios n contrast with advertised product. The formulations prepared with 8 % w/w concentration of CP F8 for instant dissolving drugs have been discovered to be more suitable than the components prepared with other artificial superdisintegrants and gave maximum drug release (%) inside 5 min. t become determined that the discharge fee turned into observed to be extra nfluenced with the aid of crospovidone superdisintegrant and the attention of the disintegrant employed n the coaching of the tablets. The optimised formula F8 drug launch with crospovidone s barely extra than that of the other artificial superdisintegrant.

REFERENCES

1. O. Article, "Formulation and Evaluation of Effervescent Granules of Ibuprofen," 2019; 11(6): p.g11–14.
2. Hiola R, Tunadi R. Development of effervescent granules of corn milk supplemented with probiotic lactobacillus strain shirota. Int J Appl Pharm 2018; 10:71-5.
3. Gopinath E. Evaluation of musa acuminate fruit as a natural super disintegrates for tablet formulation. AJPCR 2018; 11:167-71.
4. Thulluru A, Kumar VS, Kumar MP, Roshitha B. Effect of effervescence in combination with super disintegrates in the formulation of propranolol HCl oral disintegrating tablets. Aian J Pharm Clin Res2017; 10: p.g 227-34.
5. Sandhyarani G, Kumar KP, Formulation and evaluation of fast dissolving Tablet of imidapril, Indian Journal of Pharmaceutical Science& Research, 2017;4(3) p.g 147-150
6. Swain S and Beg S. Emergence in the Lipid- Based Nanostructure Systems for Optimizing Oral Delivery of Drugs. Pharmaceutical Regulatory Affairs, 2016; P.g 157-163.
7. Bhattacharjee J. Mass Drugs Administration in India - A Failure Story. Epidemiology, Sunnyvale, 2016; p.g 252- 255
8. Compression, F. F. Design, and S. G. Highway, 2015; 6(12) p.g 5077– 5084
9. N. Panda, A. V. Reddy, G. V. S. Reddy, and K. C. Panda, "Formulation Design And In Vitro Evaluation of Zolmitriptan Immediate Release Tablets Using Primojel and AC-Di- Sol," No. July, 2015 p.g 125-130
10. RB Saud agar. Formulation and characterization and evaluation of mouth dissolving tablet of lisinopril by using dehydrated banana powder as a natural polymer. WJIPR 2015; p.g 763-74.
11. Cho SK. The Synergistic Effects ofPioglitazone on the Glucose-Lowering Action of Metformin in Relation to OCT1 and Gluts m-RNA Expression in Healthy Volunteer. Clinical Pharmacology and Biopharmaceutics, 2015; 3:129.
12. Ehrenpreis ED, A Survey of Lawsuits Filed for the Complaint of Tardive Dyskinesia Following Treatment with Metoclopramide. Clinical Pharmacology andBiopharmaceutics, 2015; 4:131
13. J Ham, S Parthiban, A Vikneswari, GP Sentil kumar, T Tamiz Mani. Formulation and evaluation of orodispersible liquisolid compacts of meloxicam using banana powder as natural super disintegrates. AJPRS 2015; p.g 25-38.
14. Rita and M. Stearate, "Imedpub Journals Formulation and Evaluation of Sustained Release Matrix Tablets of Nifedipine Abstract," Ann. Clin. Lab. Res., 2015; p.g 10–15.
15. S. R. Jayaswal, V. Felix Joe, and B. A. Viswanath, "Formulation and Evaluation of Sustained Release Matrix Tablets of Glibenclamide," Int. J. Pharm. Technol., 2014; 6(2): 296-303
16. Kokardekar RR, Development and Evaluation of Sustained Release Microspheres of Glibenclamide by Emulsion Solvent Evaporation Method. Clinical Pharmacology and Biopharmaceutics, 2014; 3:127
17. Meier, Barry (1 January 2013). "Energy Drinks Promise Edge, but Experts Say Proof Is Scant". The New York Times (New York: NYTC). ISSN 0362-4331. Retrieved 26 September 2014.

18. Liberman HA, Lachman L, Schwartz JB, Pharmaceutical Dosage forms- Tablets, 2nd edition, vol - I, Marcel Dekker, Inc., New York, 1-128, 195-245. Vol 4 | Issue 3 | 2014 | 200-206. 206 | P a g e
19. Skalkz BN, Note on the "Molecular Pharmaceutics and Organic Process". Journal of Molecular Pharmaceutics & Organic Process Research, 2013; p.g 104-11
20. Cano-Marquina A, Tarín JJ, Cano A (May 2013). "The impact of coffee on health". Maturitas 75 (1): 7–21.
21. N. D. Banerjee, "Formulation and Evaluation of Antacid Analgesic Tablet CHM Campus, Ulhasnagar- 03, Maharashtra, India," 2013; 4(6):2327–2335. Doi: 10.13040/IJPSR.0975-8232.4 (6).2327-35.
22. Abolfazl Aslani, Fatemeh Fattahi. Formulation characterization and physicochemical evaluation of potassium citrate effervescent tablet. Adv Pharm Bull 2013; p.g 217–25
23. R Margret chandira, Debjit Bhowmik, Rahul Yadav, B Jayakar, K Sampath Kumar. Formulation and evaluation of the oral tablets ibuprofen. Pharma Innovation 2012; 1:32-42.
24. Sandhya S, Gowthami G, Vinod KR, VidyaSravanthi E, Saikumar P, Rao Knv, et al. Formulation and evaluation of herbal effervescent granules incorporated with limnophila indica extract for bacillary dysentery. Ann Bio Res 2012; 3:63-72.
25. Shialajan S, Menon S, Polymarker based standardization of an ayurvedic formulation Lavangadi Vati using high performance thin layer chromatography, J Pharm Res, 4, 2011, 467-70.
26. Hamrapurkar PD, Jadhav K, Zine S, Quantitative estimation of piperine in Piper nigrum and Piper longum using high performance thin layer chromatography, J Appl Pharm Sci, 1, 2011, 117-20.
27. Senthil P, Suresh Kumar CH, Narasimha Raju, S Mohideen. Formulation and evaluation of gastric oral floating tablet of glipzide. Int J Biol Pharm Res 2010 p.g 108-13
28. Patel RK, Kanani RJ, Patel VR, Patel MG, Development and validation of HPTLC method for simultaneous quantification of vasicine and piperine in Vasavaleha, Int J Pharm Res, 2, 2010, p.g 14-7
29. Shailajan S, Singh A, Tiwari B. Quality control and standardization of an ayurvedic Taila formulation. Int J Biomed Res Anal, 1, 2010, 78-81.
30. Bhosale AV, Hardikar SR, Patil N, Patel U, Sumbe Y, Jagtap R. Formulation and in vitro evaluation of microbially triggered ibuprofen. Int J PharmTech Res 2009; p.g 328-33.
31. S Patel, Natvarlal M Patel. Development of directly compressible co-processed Excipient for dispersible tablets using 32 full factorial designs. Int J Pharm Sci 2009; p.g 125-48.
32. Darelius A, Rasmuson A, Bjorn IN, Folestad S. High shear wet granulation modelling-a mechanistic approach using population balances. Powder Technology, 160, 2005, p.g 209–218.
33. Kaerger S, Edge S, Price R. Influence of particle size and shape on flowability and compatibility of binary mixtures of paracetamol and microcrystalline cellulose. Eur J Pharm Sci 2004; p.g 173-9
34. Macquet, A., Ralet, M.-C., Kronenberger, J., Marion-Poll, A. & North, H. M. In situ, chemical and macromolecular study of the composition of Arabidopsis thaliana seed coat mucilage. Plant Cell Physiol. 48, 984–999 (2007).
35. Harpaz-Saad, S. et al. Cellulose synthesis via the FEI2 RLK/SOS5 pathway and CELLULOSE SYNTHASE 5 is required for the structure of seed coat mucilage in Arabidopsis. Plant J. 68, 941–953 (2011).
36. Yang, B. et al. TRM 4 is essential for cellulose deposition in Arabidopsis seed mucilage by maintaining cortical microtubule organization and interacting with CESA 3. New Phytol. 221, 881–895 (2019).
37. Tonelli, A. E., and M. Srinivasarao, *Polymers from the Inside Out*. 2001, New York: John Wiley & Sons.
38. Ward, T. C., *Molecular Weight Distributions in Synthetic Polymers*. Journal of Chemical Education. 1981. **58**(11): p. 867.
39. Albert, A.A. and Serjeant, E.P (1984) ionization constants of Acids and Bases. Wiley, Newyork.
40. Yalkowiski, S.H.andRoseman,T.J(1981) Techniques of Solubilization of Drugs,Chapter3,ed.S.H.Yalkowski Marcel Dekker,Newy.
41. Kaplan, S.A.(1972)Drug Metab.Rev,1,15 -32.
42. Davies,S.S and Higuchi,T. (1970) j. Pharm Sci.,59-137
43. Leon Lachman, Herbart liebeman. The theory and practice of industrial pharmacy .Indian Edition CBS publishers.2009.
44. Panigrahi R., Chowdary K.A., Mishra G., Behera S., Bhowmik M.: Universal Pharm. Life. Sci. 2, 110 (2002).
45. Khinchi M.P., Gupta M.K., Bhandari A.,.Agarwal D., Sharma N.: Int. J. Pharm. Sci. Res. 2, 145 (2011). 13.