Formulation, Characterization, And Evaluation of Oral Dispersible Tablets (ODTS) of Tenoxicam

Shaikh Mujtaba[1], Ruhi Anjum[2] Dr. Syed Areefulla Hussainy[3], Dr. Faizan Sayeeed[4] Dr. Abdul Sayeed[5]

[1]Research Scholar MESCO College of Pharmacy Hyderabad.
[2,3,4,5]Professor, MESCO college of Pharmacy Hyderabad.

ABSTRACT:
The present study aims at the formulation, characterization, and evaluation of oral dispersible tablets (ODTs) of Tenoxicam to improve patient compliance and ensure faster onset of action, particularly in patients with swallowing difficulties. Tenoxicam, a non-steroidal anti-inflammatory drug (NSAID) with poor aqueous solubility and delayed onset when administered in conventional tablet form, was selected for this study. Oro dispersible tablets were prepared by direct compression method using various super disintegrants such as sodium starch glycolate, Starch and Spray dried lactose in different concentrations. The pre-compression parameters including bulk density, tapped density, angle of repose, and compressibility index were evaluated and found within acceptable limits. The formulated tablets were assessed for post-compression parameters such as hardness, friability, weight variation, drug content, wetting time, disintegration time, and in vitro drug release. Among the various formulations, the F2 optimized batch exhibited rapid disintegration within seconds and showed more than 95% drug release within 60 minutes, indicating improved dissolution characteristics.

Keywords: Tenoxicam, Oral Dispersible Tablets

1. INTRODUCTION

The oral route of administration is considered as the most widely accepted route because of its convenience of self-administration, compactness and easy manufacturing. But the most evident drawback of the commonly used oral dosage forms like tablets and capsules is difficulty in swallowing, leading to patients incompliance particularly in case of paediatric and geriatric patients, but it also applies to people who are ill in bed and to those active working patients who are busy or travelling, especially those who have no access to water.[1] For these reasons, tablets that can rapidly dissolve or disintegrate in the oral cavity have attracted a great deal of attention. Oral dispersible tablets are not only indicated for people who have swallowing difficulties, but also are ideal for active people.[2] A Oro Dispersible tablet (ODT) is a solid dosage form that contains medicinal substances and disintegrates rapidly (within seconds) without water when placed on the tongue. The drug is released, dissolved, or dispersed in the saliva, and then swallowed and absorbed across the GIT. US FDA defined ODT tablets as “A solid dosage form containing medicinal substances which disintegrates rapidly usually within a matter of seconds, when placed upon the tongue”.

Recently European Pharmacopoeia used the term 'Oro Dispersible tablet' as a tablet that is to be placed in the mouth where it disperses rapidly before swallowing Orally disintegrating tablets are also called as mouth-Dispersible tablets, Oro disintegrating tablets, Oro Dispersible tablets, Oro Dispersible tablets, rapimelts, porous tablets, quick Dispersible tablet[3].

The US Food and Drug Administration responded to this challenge with the 2008 publication of Guidance for Industry: Orally Disintegrating Tablets [4].Three main points stand out in the final guidance:

- ODTs should have an *in vitro* disintegration time of approximately 30sec or less.
- Generally, the ODT tablet weight should not exceed 500 mg, although the combined influence of tablet weight, size, and component solubility all factor into the acceptability of an ODT for both patients and regulators.
- The guidance serves to define the upper limits of the ODT category, but it does not supersede or replace the original regulatory definition mentioned. In other words, disintegration within a matter of seconds remains the target for an ODT.

2.METHODOLOGY

SOLUBILITY STUDIES OF TENOXICAM

- Dissolve excess amount of drug in all the four buffers (pH 4.5 acetate buffer, pH6.8 Phosphate buffer, water pH 7, 0.1 N HCL) so that there is super saturation.
- Take 10 mL / 25 mL of each buffer in test tubes/ volumetric flasks and add weighed equal amounts of excess drug in all of them.
- Stir continuously for 1/2 hr to 1 hr/place it an vortex mixer. Then allow it to stand for 24 hrs. Filter the solution. Take samples and measure the absorbance at λ_{max} of drug.
- Then calculate the amount of drug present in each sample per 10 mL of solvent taken.

BUFFERS PREPARATION:

- **pH 4.5 acetate buffer Preparation:** 136 grams of sodium acetate and add 77 grams of Ammonium acetate in water and dilute water with 1000 mL and add 250 mL glacial acetic acid and mix.
- **pH 6.8 Phosphate buffer Preparation:** 6.8 gram of KH_2PO_4 and 8 grams of NAOH in 1000 mL with distilled water.
- **Water pH 7 :** Purified distilled water with measured ph.
- **0.1 N HCL (pH 1-2) Preparation:** 8.65 mL of HCL dissolved in 1000 mL of water. Measure pH and adjust with concentration HCL.

CONSTRUCTION OF CALIBRATION CURVE OF TENOXICAM:

- Accurately weighed 100 mg of drug was transferred to 100 ml volumetric flask and dissolved in methanol, this was considered as stock solution (I).
- To 1 ml of stock solution (I) 9 ml of pH 6.8 phosphate buffer was added and this was considered as stock solution (II).
- From stock solution (II) 0.2 ml, 0.4 ml, 0.6 ml, 0.8 ml,1ml were taken and was made up the volume to 10ml with pH 6.8 Phosphate buffer to get respective concentrations of (2, 4, 6, 8 and 10) µg/ mL.
- Prepared samples were analyzed by using ultra violet double beam spectrophotometer at λmax 273 nm.
- The calibration curve was plotted by taking concentration on x-axis and absorbance on y-axis.

PREPARATION OF TENOXICAM ORAL DISSOLVING TABLETS

Preparation of Tenoxicam Oral dissolving tablets by direct compression method

- Drug different concentrations of diluents and super Disintegrate were accurately weighed and passed through a 40-mesh screen to get uniform size particles and mixed in a glass mortar for 15 minutes.
- The obtained blend was lubricated with Mg stearate and glidant (Aerosil) was added and mixing was continued for further 5 minutes.
- The resultant mixture was directly compressed into tablets by using 6mm round flat faced punch of rotary tableting machine. Compression force was kept constant for all formulations.

Table 2.1 Composition of Tenoxicam Oral Dissolving Tablet.

Ingredients (mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9
Tenoxicam	20	20	20	20	20	20	20	20	20
Sodium starch glycolate	10	20	30	-	-	-	-	-	-
Starch	-	-	-	10	20	30	-	-	-
Spray dried lactose	-	-	-	-	-	-	10	20	30
Mannitol	5	5	5	5	5	5	5	5	5
Aspartame	6	6	6	6	6	6	6	6	6
Aerosil	2	2	2	2	2	2	2	2	2
Mg.Stearate	4	4	4	4	4	4	4	4	4
Talc	4	4	4	4	4	4	4	4	4
Microcrystalline cellulose	49	39	29	49	39	29	49	39	29
Total weight of tablet	100	100	100	100	100	100	100	100	100

EVALUATION OF PRE-COMPRESSION PARAMETERS OF POWDER BLEND ANGLE OF REPOSE:

Angle of repose was determined using funnel method. The blend was poured through a funnel that can be raised vertically until a maximum cone height (h) is obtained. Radius of the heap (r) was measured and angle of repose (θ) was calculated using the following formula.

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

Table2.2: Angle of repose as an indication of powder flow properties

Sr. No	Angle of Repose (°)	Type of Flow
1	< 20	Excellent
2	20 – 30	Good
3	30 – 34	Passable
4	> 34	Very Poor

BULK DENSITY:

Apparent bulk density (ρ_b) was determined by pouring the powder blend into a graduated cylinder. The bulk volume (V_b) and weight of the powder (M) were determined. $\boldsymbol{\rho_b = M / V_b}$

TAPPED DENSITY:

The measuring cylinder containing a known mass of blend (M) was tapped for a fixed time (100 tapping). The minimum volume (V_t) occupied in the cylinder and weight of the blend was measured. The tapped density (ρ_t) was calculated using the following formula. $\boldsymbol{\rho_t = M / V_t}$

% COMPRESSIBILITY INDEX OR CARR'S INDEX:

- The simplest way for measurement of free flow of powder is compressibility, an indication of the ease with which a material can be induced to flow is given by compressibility index.

Carr's Index = $\boldsymbol{\rho_b - \rho_t \;/\; \rho_b \quad 100}$

Where ρ_t = tapped density

ρ_b = bulk density

Table2.3 : Relationship between % compressibility and flow ability

% Compressibility	Flow ability
5 – 12	Excellent
12 – 16	Good
18 – 21	Fair Passable
23 – 35	Poor
33 – 38	Very Poor
< 40	Very Very Poor

HAUSNER'S RATIO (H):

Hausner's ratio is an indirect index of ease of powder flow. It is calculated by the following formula:

Hausner's ratio (H) = $\boldsymbol{\rho t/\rho b}$

Where ρ_t = tapped density

ρ_b = bulk density

EVALUATION OF POST COMPRESSION PARAMETERS OF TENOXICAM ODTs:

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.

Various tests performed are:

- Weight variation test
- Thickness measurement
- Hardness
- Friability
- Drug Content uniformity
- Wetting time and Water absorption ratio
- *In vitro* dispersion Time
- *In vitro* disintegration Time

- *In vitro* dissolution studies

WEIGHT VARIATION TEST:

Method: 20 tablets were randomly selected from each formulation and their individual weights and average weight of all 20 tablets was calculated by weighing on an electronic balance. The Mean ± S.D. were noted

Table 2.4: Weight Variation Limits

IP/BP	Limit	USP
80 mg or less	10%	130mg or less
More than 80mg or Less than 250mg	7.5%	130mg to 324mg
250mg or more	5%	More than 324mg

THICKNESS:

Method: Randomly 10 tablets were taken from each formulation and their thickness was measured using a digital micrometer (Mitutoyo Corp, Kawasaki, Japan). Average thickness and standard deviation values were calculated. The tablet thickness should be controlled within a ± 5% variation of standard value.

HARDNESS:

Method: The tablet hardness of different formulations was measured using the 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 gauge 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 2.5 kg / cm^2 is considered acceptable for uncoated tablets.

The hardness for FDTs should be preferably 2.5 to 3 kg / cm^2.

FRIABILITY:

Method: This test was performed using a laboratory friability tester known as Roche friabilator. 20 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 minutes. After the process, these tablets were de - dusted and reweighed. Percentage loss of tablet weight was calculated. Friability values below 1% are generally acceptable.

$$\% \text{ Friability} = \frac{W_1 - W_2}{W_1} \quad 100$$

Where W_1 = Initial weight of 10 tablets.

W_2 = Final weight of 10 tablets.

DRUG CONTENT:

Method: 3 tablets were randomly selected, weighed and finely powdered and quantity of powder equivalent to one tablet was added to 100 ml of pH 6.8 Phosphate buffer in a volumetric flask. A volumetric flask was then placed on a rotary shaker.

An aliquot of solution was centrifuged and supernatant was filtered through a 0.22µ filter. Absorbance of the resulted supernatant solution was measured using U.V Visible double beam spectrophotometer at a wavelength of 273 nm against pH 6.8 Phosphate buffer as blank. Concentrations and amount of drug present in one tablet were calculated.

IN VITRO DISINTEGRATION TIME*:*

Method: A piece of tissue paper folded twice was placed in a small Petri dish containing 6ml of pH 6.8 Phosphate buffer. 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 and break down into small particles was noted as the *in vitro* disintegration time. To check for reproducibility, the measurements were carried out in triplicates (n=3). The disintegration time was recorded using a stopwatch.

IN VITRO DISSOLUTION STUDIES:

Method: Dissolution test was carried out by using USP type II apparatus. The paddle was rotated at 50 rpm. pH 6.8 Phosphate buffer was used as dissolution medium (900 mL) and was maintained at 37 ± 1ºC. Samples of 5ml were withdrawn at predetermined intervals (5, 10, 15, 20 , 30, 45 and 60), filtered and replaced with 5ml of fresh dissolution medium.

The collected samples were suitably diluted with dissolution fluid, where ever necessary and were analyzed for the drug at 273 nm by using ultra violet double beam spectrophotometer. Each dissolution study was performed for three times and mean values were taken.

Fourier Transform Infrared Spectroscopy (FTIR)

FTIR studies were performed on drug, optimized formulation using Bruker FTIR. The samples were analyzed between wave numbers 4000 cm^{-1} and 400 cm^{-1}.

RESULTS AND DISCUSSION

Solubility studies

According to pharmacopeial limits it is freely soluble in water, 0.1N HCL, 6.8 phosphate buffer. The results were shown in Table.

Table 3.1: Solubility studies

Medium	Amount Tenoxicam present (µg/mL)
Water pH 7	22.57
0.1N HCL	89
Phosphate buffer pH(6.8)	94
pH 4.5 acetate buffer	91

PREPARATION OF CALIBRATION CURVE OF TENOXICAM

The regression coefficient was found to be 0.999 which indicates a linearity with an equation of $y = 0.0713x - 0.0007$. Hence beer - Lambert's law was obeyed.

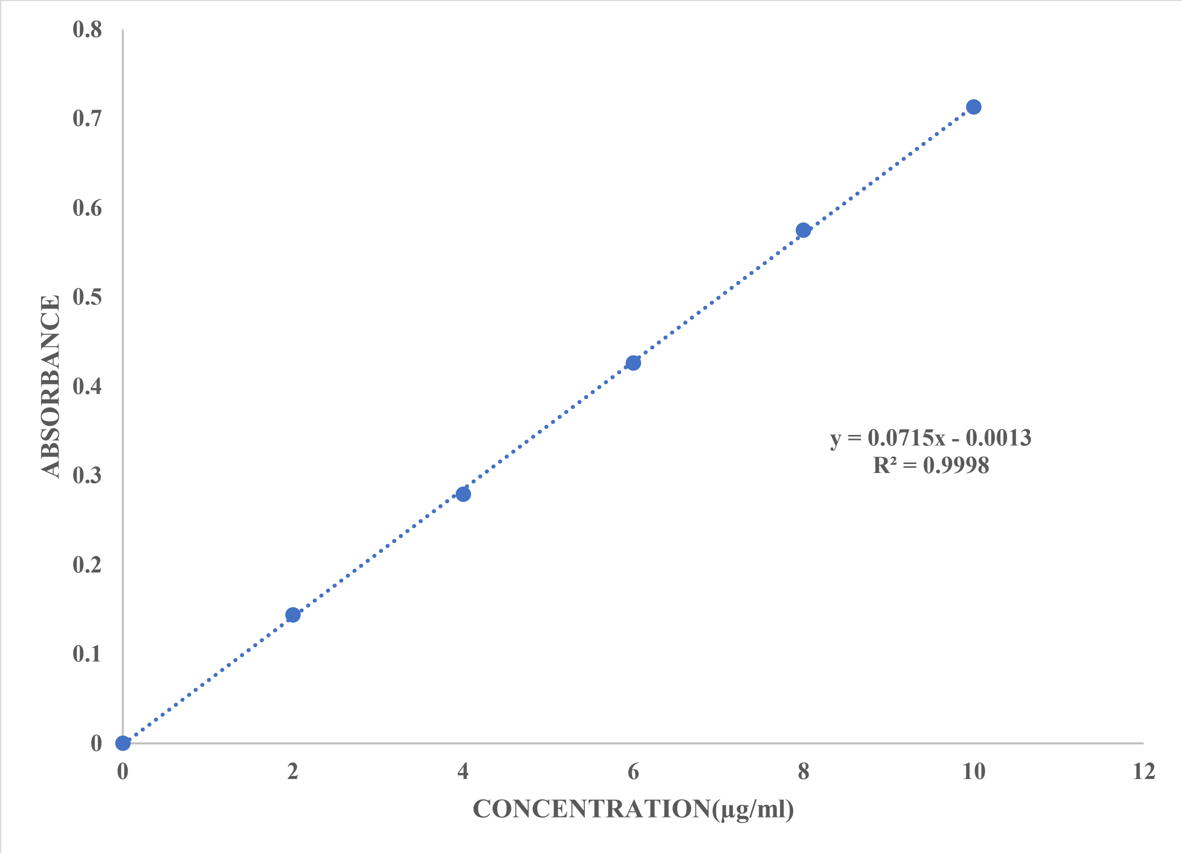

Fig: Calibration curve of Tenoxicam

EVALUATION OF PRE - COMPRESSION PARAMETERS OF POWDER BLEND

Table3.3 Evaluation of pre-compression parameters of powder blend

Formulation Code	Angle of Repose (°)	Bulk density (gm/ml)	Tapped density (gm/ml)	Carr's index (%)	Hausner's Ratio
F1	25.01	0. 59	0.57	14.03	1.16
F2	26.8	0. 46	0.67	16.41	1.19
F3	27.7	0. 32	0. 54	18.75	1.23
F4	25.33	0.54	0.64	15.62	1.18
F5	25.24	0.52	0.65	18.46	1.22
F6	28.12	0. 46	0. 56	15.15	1.17
F7	27.08	0.58	0.69	15.94	1.18
F8	25.12	0.48	0.67	15.78	1.18
F9	26.45	0.54	0.65	16.92	1.25

- For each formulation blend of drug and excipients were prepared and evaluated for various pre compression parameters described earlier in methodology chapter.
- The bulk density of all formulations was found in the range of (0.32-0.59**)** and tapped density was in range of (0.54**-**0.69).
- The Carr's index and Hausner's ratio was calculated from tapped density and bulk density.

EVALUATIONS OF POST COMPRESSION PARAMETERS OF TENOXICAM ODTs

Table3.4: Evaluation of post compression parameters of Tenoxicam Oral dissolving tablets

Formulation codes	Average Weight (mg)	Hardness(kg/cm2)	Friability (%loss)	Thickness (mm)	Drug content (%)	*In vitro* Disintegration Time (min)
F1	98.31	2.5	0.25	2.8	99.76	1.3
F2	100.36	2.5	0.15	2.9	99.45	1.4
F3	97.17	2.6	0.22	1.9	99.34	1.6
F4	99.22	2.7	0.55	2.9	99.87	1.8
F5	99.58	2.5	0.65	1.7	99.14	1.1
F6	98.73	2.7	0.34	2.6	98.56	1.3
F7	100.22	2.7	0.57	2.4	98.42	2.6
F8	97.35	2.8	0.49	2.7	99.65	1.7
F9	98.44	2.2	0.55	3.0	99.12	1.3

Weight variation and thickness: All the formulations were evaluated for uniformity of weight using electronic weighing balance and the results are shown above. The average tablet weight of all the formulations were noted down.

Hardness and friability: All the ODT formulations were evaluated for their hardness, using Monsanto hardness tester and the results are shown above. The average hardness for all the formulations was found to be between (2.2 to 3.0) Kg/cm^2 which was found to be acceptable.

The order of Hardness of tablets

Mannitol < Microcrystalline cellulose<starch< Spray dried Lactose

The hardness was more for tablets prepared by using Spray dried lactose.

Friability was determined to evaluate the ability of the tablets to withstand the abrasion during packing, handling and transporting. All the ODT formulations were evaluated for their percentage friability using Roche friabilator and the results are shown above. The average percentage friability for all the formulations was between **0.15 to 0.65**, which was found to be within the limit. Addition of Aerosil resulted in appreciable decrease in friability.

Drug content: All the formulations were evaluated for drug content according to the procedure described in methodology section and the results were shown above. The assay values for all the formulations were found to be in the range of **(98.62 to 99.98).** According to IP standards the tablets must contain not less than 95% and not more than 105% of the stated amount of the drug. Thus, all the FDT formulations comply with the standards given in IP.

***In vitro* disintegration time:** *In vitro* disintegration studies showed from 1.1 to 2.6 minutes. These results indicate that Mannitol showed very less disintegration time to break the tablets but less dispersion was possible.

The order of disintegration of tablets

Mannitol < Microcrystalline cellulose<starch< Spray dried Lactose

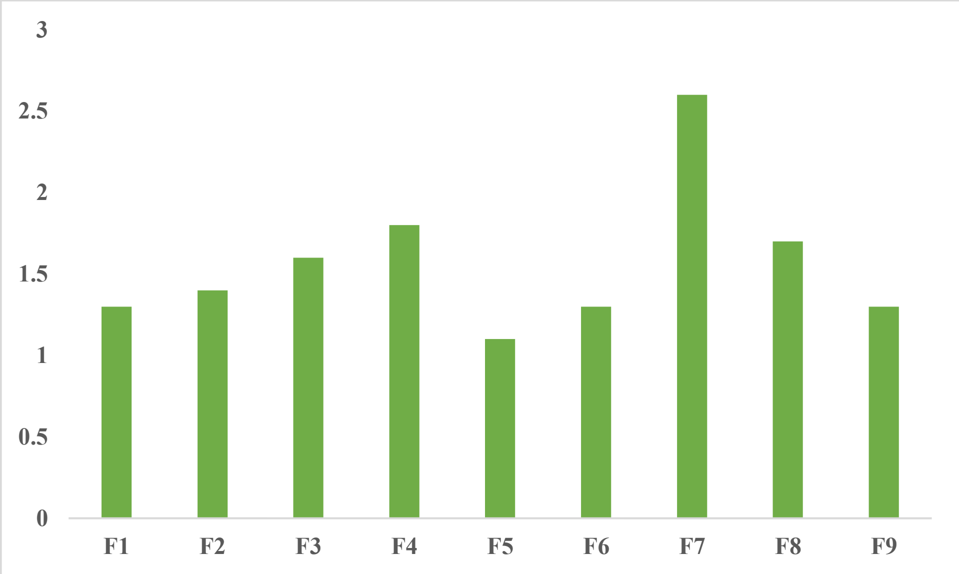

Figure: *In Vitro* Disintegration time of the all formulations F1- F9

IN VITRO DRUG RELEASE STUDIES OF TENOXICAM

Table:3.5 Dissolution data of Tenoxicam containing Sodium starch glycolate

TIME(MIN)	% DRUG RELEASE		
	F1	F2	F3
0	0	0	0
5	24.35	35.03	28.91
10	31.55	43.26	34.73
15	43.68	61.4	52.41
20	48.11	72.22	62.01
30	63.85	89.11	68.18
45	88.62	97.91	76.34
60	91.96	99.25	89.56

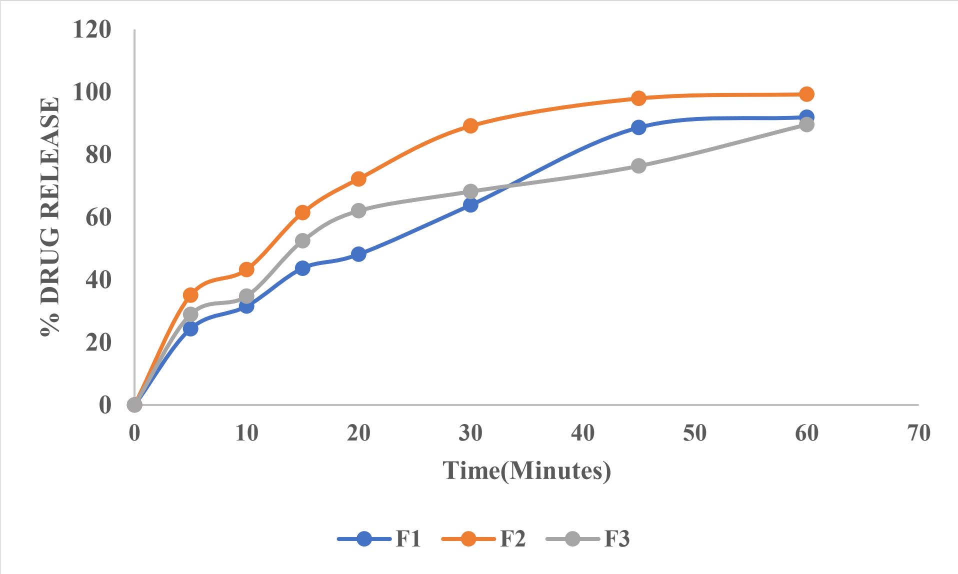

Figure Graph representing dissolution data of Tenoxicam containing Sodium starch glycolate

Table 3.6: Dissolution data of Tenoxicam containing Starch

TIME(MIN)	% DRUG RELEASE		
	F4	F5	F6
0	0	0	0
5	31.53	27.72	39.42
10	35.36	42.22	46.13
15	46.74	48.45	57.55
20	58.49	55.16	71.39
30	66.35	76.17	88.34
45	73.85	84.08	95.19
60	85.81	89.12	98.28

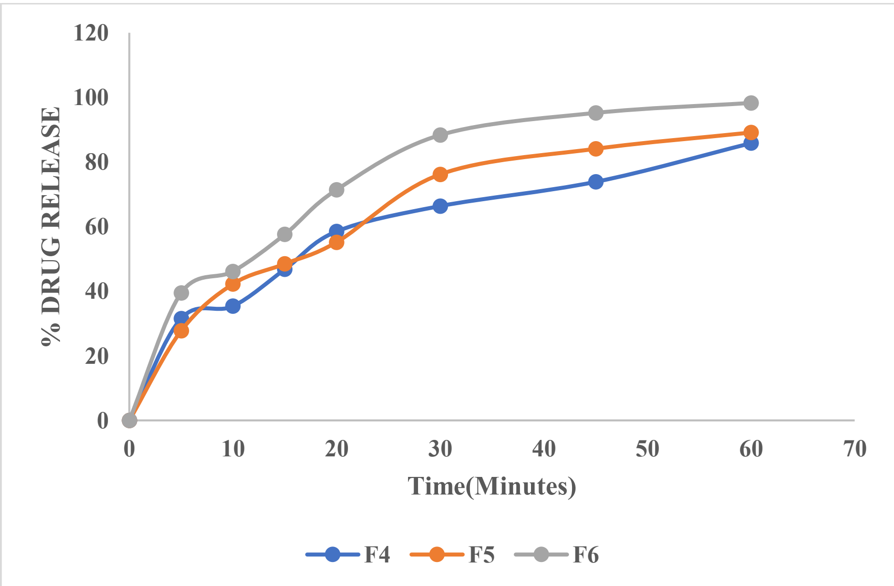

Figure : Graph representing dissolution data of Tenoxicam containing Starch

Table 3.7: Dissolution data of Tenoxicam containing Spray dried lactose

TIME(MIN)	% DRUG RELEASE		
	F7	F8	F9
0	0	0	0
5	28.94	38.62	33.99
10	32.26	49.14	45.13
15	44.64	55.03	59.86
20	53.16	69.73	61.15
30	66.75	76.97	79.88
45	78.01	87.31	81.29
60	96.74	93.22	89.43

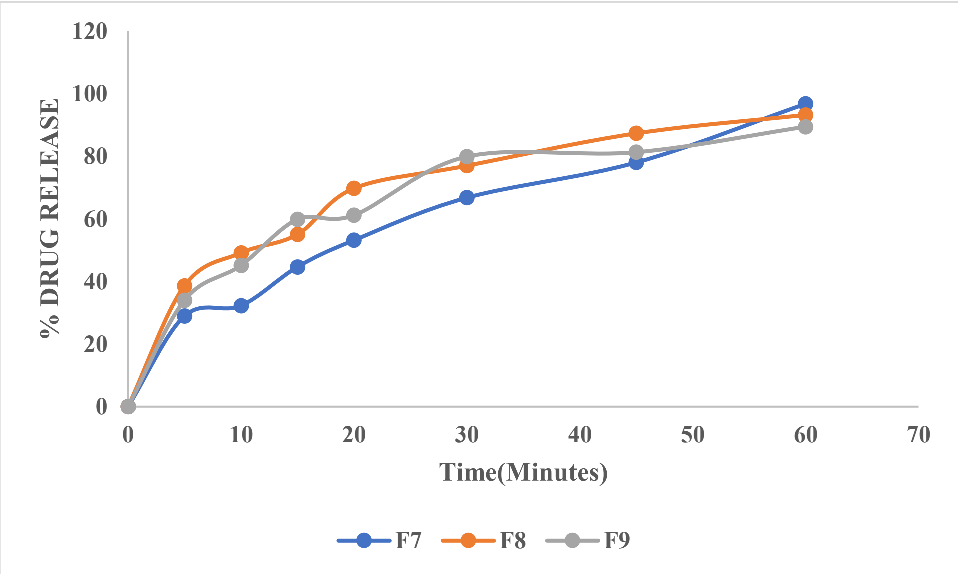

Figure : Graph representing dissolution data of Tenoxicam containing Spray dried lactose

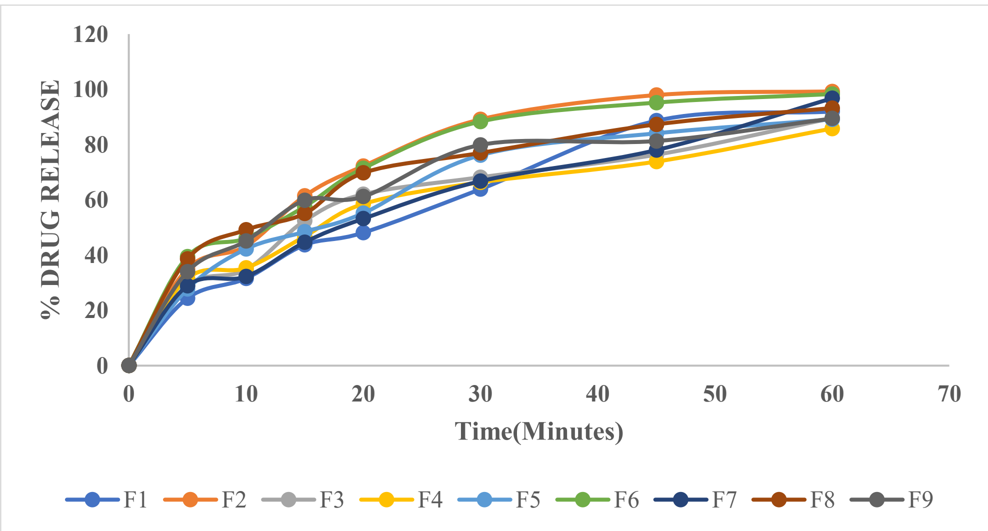

Figure : Graph representing dissolution data of Tenoxicam all formulations (F1- F9)

Different diluents used were Sodium starch glycolate, Starch and Spray dried Lactose. F4- F6 showed good drug release when compared to other batches but compromising on disintegration time and F7-F9 showed good disintegration time when compared to other batches but compromising on drug release all formulations F2 showed maximum drug release after 60 minutes and disintegration time of 3.6 minutes. Hence **F2** formulation was concluded as optimised formulation.

FTIR RESULTS:

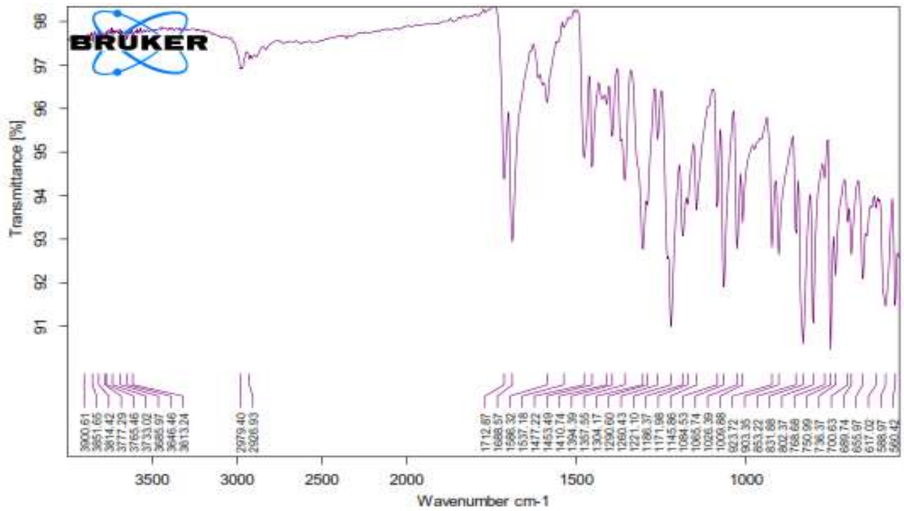

Fig : FTIR of Tenoxicam Pure drug

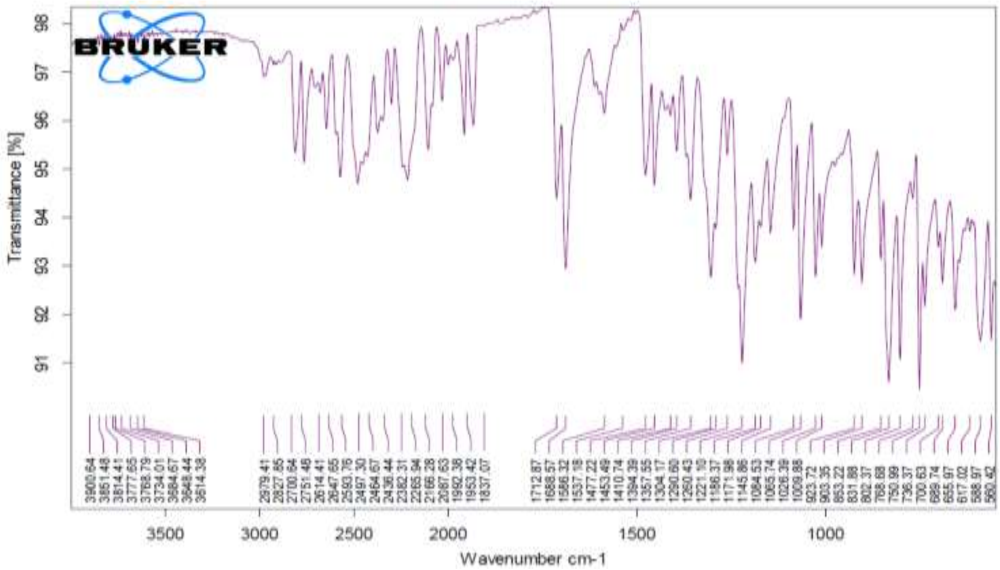

Fig : FTIR of Optimised formulation

Tenoxicam was mixed with various proportions of excipients showed no colour change, providing no drug-excipient interactions.

CONCLUSION

The present study successfully focused on the formulation, characterization, and evaluation of oral dispersible tablets (ODTs) of Tenoxicam to enhance patient compliance and provide rapid therapeutic action. Various formulations were developed using different concentrations of super disintegrants and evaluated for pre-compression and post-compression parameters. Among the prepared batches, the optimized formulation demonstrated excellent physicochemical properties, including satisfactory hardness, friability, uniform weight, and drug content. The formulation showed a rapid disintegration time and faster drug release, with more than 95% drug release within a short time, indicating enhanced bioavailability potential through oral dispersible delivery

REFERENCES

1. Abdelbary, A., Elshafeey, A. H., and Zidan, G., Comparative effects of different cellulosic-based directly compressed orodispersable tablets on oral bioavailability of famotidine. Carbohydrate polymers., 77, 799-806 (2009).
2. Adamo, F., Valentina, B., Gian, C.C., Celestino, R., Carlos ,A, F, M.,Fast dispersible/slow releasing ibuprofen tablets. Eur. J. Pharm. Biopharm.., 69, 335–341 (2008).
3. Andreas, P., and Thomas, F., Pioglitazone: an antidiabetic drug with the potency to reduce cardiovascular mortality. Expert Opin. Pharmacother., 7, 463-476 (2006).
4. Ashwini, R., Mangesh, R., and Rahul, R., Formulation Design and Optimization of Novel Taste Masked Mouth-Dissolving Tablets of Tramadol Having Adequate Mechanical Strength. AAPS PharmSciTech., 10, 574-581 (2009).
5. Battu, S. K., Michael, A. R., Soumyajit, M., and Madhusudan, Y., Formulation and evaluation of rapidly disintegrating fenoverine tablets: Effect of superdisintegrants. Drug Dev. Ind. Pharm., 33. 1225-1232 (2007).
6. Bhatu, P. B., and Atish, M., The technologies used for developing orally disintegrating tablets: A review. Acta Pharm., 61, 117–139 (2011).
7. Chattopadhyay, R. R., and Bandyopadhyay, M., Effect of Azadirachta indica leaf extract on serum lipid profile changes in normal and streptozotocin induced diabetic rats. Afr. J. Biomed. Research., 8, 101-104 (2005).
8. Chang, R.K., Guo, X., Burnside, B., Couch, R., Fast-dissolving tablets. Pharm. Technol., 24, 52-58 (2000).
9. Debjit, B., Chiranjib, B., Krishnakanth., Pankaj., Margret, R., Fast Dissolving Tablets: An Overiew. Journal. Chem. Pharm. Research., 1(1), 163 – 177 (2009).
10. Dobetti, L., Fast-Melting Tablets: Developments and Technologies. Pharm. Technol. Drug Del. Suppl., 3, 44-50 (2001).
11. Francesco, C., Elisa, C., Paola, M., Susanna, B., Chiara, G., and Luisa, M., Diclofenac fast-dissolving film: suppression of bitterness by a taste-sensing system. Drug Dev. Ind. Pharm., 37, 252–259 (2011).
12. Ganesan, K., Gani, S. B., and Arunachalam, G. M., Anti-diabetic Activity of Helicteres isora L. Bark Extracts on Streptozotocin-induced Diabetic Rats. Int. J. Pharm Sci. Nano. Technol., 1, 379-382 (2009).
13. Goel, H., Arora, A., Tiwary, A. K., and Rana, V., Development and evaluation of mathematical model to predict disintegration time of fast disintegrating tablets using powder characteristics. Pharm. Dev. Technol., 16, 57-64 (2011).
14. Guptha, A., Mishra, A. K., Guptha, V., Bansal, P., Singh, R., and Singh, A. K., Recent Trends of Fast Dissolving Tablet – An Overview of Formulation Technology. Int. J. Pharm. Bio. Arch., 1 (1), 1 – 10 (2010).
15. James, K., Dissolution testing of orally disintegrating tablets. Diss.Tech.,10(2), 6-8 (2003).
16. Jianchen, X., Li, B., and Kang, Z., Taste masking microspheres for orally disintegrating tablets. Int. J.

Pharm., 359, 63-69 (2008).
17. Jinichi, F., Etsuo, Y., Yasuo, Y., and Katsuhide, T., Evaluation of rapidly disintegrating tablets containing glycine and carboxymethylcellulose. Int. J. Pharm., 310, 101-109 (2006).
18. Kayitarea, E., Vervaet, C., Mehuys, E., Kayumba, P.C., Ntawukulilyayo, J., Karemac, C., Bortel, V., Remon, J. P., Taste-masked quinine pamoate tablets for treatment of children with uncomplicated Plasmodium falciparum malaria. Int. J. Pharm., 392, 29–34 (2010).
19. karthik karumuri1, dr. k.s.g arul kumaran2, and dr. arunkumar nagalingam3. comparative study of natural and synthetic superdisintegrants in the formulation of oral disintegrating tablets using bambuterol hydrochloride as model drug. Indo American Journal of Pharmaceutical Research., 3(9), 7421-7430 (2013)
20. Kuchekar, B. S., Arumugam, V., Formulation and evaluation of Metronidazole orodispersible tablets. Indian J. Pharm. Edu., 35, 150-158 (2001).
21. Mahmoud Mahyoob Alburyhi1, Maged Alwan Noman, Abdalwali Ahmed Saif, Yahya Abduh Salim Mohamed and Jalal H. Abdulla. Formulation And Evaluation of Domperidone Oro dispersible Tablets. World Journal of Pharmacy and Pharmaceutical Sciences, Vol 13, Issue 3, 2024.
22. Mahmoud Mahyoob Alburyhi1, Maged Alwan Noman, Abdalwali Ahmed Saif, Yahya Abduh Salim Mohamed and Jalal H. Abdulla. Formulation and Evaluation of Rivaroxaban Oro dispersible Tablets. World Journal of Pharmacy and Pharmaceutical Sciences, Vol 13, Issue 2, 2024.
23. Mahmoud Mahyoob Alburyhi1, Maged Alwan Noman, Abdalwali Ahmed Saif, Yahya Abduh Salim Mohamed and Jalal H. Abdulla. Formulation and Evaluation of Ticagrelor Oro dispersible Tablets. World Journal of Pharmacy and Pharmaceutical Sciences, Vol 13, Issue 5, 2024.
24. Ahmed Elshahat, Azza A. Hasan, Hanaa A. Elghamry, Gehan F. Balata. Formulation and characterization of olanzapine-carboxylic acid cocrystals Oro dispersible tablets. Technology Volume, October 2024.
25. Sivaneshwari Srinivasan, Karthikeyan, Binoy Varghese Cherian, Santhana krisnan ramujam. Formulation and characterization of metformin hydrochloride Oro dispersible tablets. Pharmacy Volume, 2023.
26. Mahmoud Mahyoob Alburyhi, Abdalwali Ahmed Saif, Maged Alwan Noman, Sami Ahmed Saeed and Mokhtar Abd-hafiz AGhorafi. Formulation characterization and Evaluation of Diclofenac Oro dispersible Tablets. European Journal of Pharmaceutical and Medical Research. Vol 10, Issue 9, 2023.
27. Kinani, Ahmad AB Yosef; Taghi, Hassanien Sagban. Journal of Advanced Pharmaceutical and technology and research, vol 13 issue 4, 2022.
28. Nadh, T. V. Hari Hara, Kumar, P. Sivaram Ramana, M. Venkata Rao, N. Rama. Formulation and characterization of Zolmitriptan Oro dispersible Tablets. Journal of Drug Delivery & Therapeutics, Vol 11, Issue 3, p50, 2021.