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FORMULATION AND EVALUATION OF ORAL DISINTEGRATING TABLET OF TELMISARTAN USING SUPERDISINTEGRANTS

Bishnu Upreti, Suraj Kumar Sah

Abstract:
This research aims to develop and assess Oral Disintegrating Tablets (ODTs) of Telmisartan using various superdisintegrants. The superdisintegrants used in this study—crospovidone, sodium starch glycolate, and croscarmellose sodium—exhibit versatile properties that enhance the formulation of ODTs with Telmisartan, an antihypertensive drug classified under Angiotensin Receptor II (Type-AT1) Antagonists. Telmisartan, a poorly soluble drug (BCS Class II), has its absorption limited by its dissolution rate, with oral bioavailability ranging from 42% to 58%. This research aims to improve the dissolution properties of Telmisartan by formulating ODTs with these superdisintegrants.
Various batches of ODTs were prepared using different concentrations of croscarmellose sodium, crospovidone, sodium starch glycolate, and sodium bicarbonate as a disintegrant through wet granulation. Sweeteners were added to enhance the palatability of the tablets. The tablets underwent evaluation for pre-compression parameters (bulk density, compressibility, angle of repose) and post-compression parameters (hardness, weight variation, friability, disintegration time, and in-vitro dissolution profiles). Among the formulations, the one containing 5.38% crospovidone, 1.5% sodium starch glycolate, 6.9% croscarmellose sodium, and 7.7% sodium bicarbonate emerged as the best, exhibiting a 97.12% drug release within 12 minutes and a disintegration time of 17 seconds. This formulation (F4) demonstrated superior results across all evaluation criteria.

Key words: Telmisartan, Croscarmellose sodium, Crospovidone, Sodium Starch Glycolate, Sodium Bicarbonate, Oral disintegrating tablets.

1. INTRODUCTION:

Oral drug delivery holds a highly esteemed position in the pharmaceutical industry due to its simplicity, benefits, and cost-effectiveness. It is widely regarded as the most patient-compliant and safest method of drug delivery. Oral Disintegrating Tablets (ODTs), also known as Fast Dissolving Tablets, are particularly advantageous for geriatric, pediatric, and bedridden patients, as well as active individuals with busy schedules or those who frequently travel and may lack access to water. These tablets rapidly disintegrate or dissolve in saliva without the need for chewing or water. Some ODTs are designed to dissolve in saliva within a minute, providing an easy-to-swallow residue and eliminating the need for fluid intake. This makes ODTs a convenient and efficient option for drug administration in various situations. (Rao, Mounica, S., Venkatesh, & Suthakaran, 2016).

Usually Applicable Areas or Fields of Oral Disintegrating Tablets (ODTs) includes-

1. Elderly patients often struggle with conventional oral dosage forms like tablets and capsules due to conditions such as hand tremors and dysphagia.
2. Young individuals commonly experience difficulty swallowing because their muscular and nervous systems are not fully developed.

3. Other groups who may face challenges with traditional oral dosage forms include the mentally ill, physically disabled, uncooperative patients, and those on restricted liquid intake.
4. Additional reasons for the production of alternative dosage forms include:

- Unavailability or lack of water
- Difficulty swallowing solid dosage forms
- Nausea
- Motion sickness
- Sudden allergic attacks or coughing

Recent advances in Novel Drug Delivery Systems (NDDS) aim to create dosage forms that are easy to manufacture and administer, free of side effects, and designed to improve patient compliance. These systems offer immediate release and enhanced bioavailability. Among oral drug delivery systems, tablets are the most widely accepted due to their compact size, uniform dosing, and painless administration. However, dysphagia remains a common issue with conventional tablets, affecting nearly 35% of the general population and is associated with conditions such as Parkinson's disease, mental disabilities, motion sickness, unconsciousness, and lack of water (Jain, Mandal, Jain, & Banweer, 2012). To address these challenges, innovative drug delivery systems such as Oral Disintegrating Tablets (ODTs) have been developed. These novel dosage forms dissolve in saliva within seconds when placed on the tongue, making them convenient to administer anywhere and anytime without the need for water. This makes ODTs particularly suitable for children, elderly, and mentally disabled patients. The development of ODTs represents a safe and convenient method of drug administration that significantly enhances patient compliance. ODTs effectively address the limitations of other dosage forms, especially dysphagia (difficulty in swallowing), in geriatric, pediatric, and disabled patients.
The development of ODTs involves various innovative technologies beyond conventional fabrication methods, including freeze drying, fast dissolving films, sublimation, tablet molding, direct compression, cotton candy process, and spray drying. Each of these methods comes with its own set of advantages and disadvantages.

ODTs

Oral Disintegrating Tablets (ODTs) represent a new generation of formulations that combine the benefits of both liquid and conventional tablet forms while offering additional advantages over traditional dosage methods. ODTs provide more accurate dosing than oral liquids and are specifically designed for dysphasic, pediatric, and geriatric patients with swallowing difficulties. They do not require water for administration, making them highly beneficial for travelers and bedridden patients. When placed in the mouth, ODTs dissolve in saliva, preventing them from being concealed by psychotic or uncooperative patients. These products enhance patient compliance and offer manufacturers opportunities for product line extension, leading to new revenue streams.
Recent surveys have identified new methods for manufacturing ODTs that feature reduced disintegration times, pleasant mouthfeel, and effective taste masking. Technologies used for ODT fabrication include freeze drying, fast-dissolving films, sublimation, tablet molding, direct compression, the cotton candy process, and spray drying. Each method has its advantages and disadvantages and relies on principles such as enhancing porosity or using water-soluble superdisintegrants and excipients. The resulting formulations may vary based on factors like drug and dosage form, mechanical strength of the final product, formulation code, stability, mouthfeel or residue, taste, bioavailability, dissolution rate, and absorption rate.
Despite the development of numerous technologies for ODT fabrication over the past three decades, no standardized evaluation technique has been universally adopted or included in pharmacopoeias, except for the European Pharmacopoeia (EP). The EP defines ODTs as "uncoated tablets intended to be placed on the tongue where they may disperse or disappear rapidly before being swallowed." It also specifies that ODTs should disintegrate within 30 seconds to 3 minutes when subjected to standard disintegration tests for tablets and capsules. This article provides a detailed review of the evaluation measures available in the literature to characterize ODTs, considering the unique features of these novel drug delivery systems.

ODTs' Ideal properties

- It dissolves or disintegrates in the mouth within a few seconds.
- It does not require water to swallow.
- It is compatible with various excipients.

- It is portable and easy to transport.
- It allows for high drug loading.
- It shows low sensitivity to environmental conditions.
- It leaves a pleasant mouthfeel.

Pros of ODTs

Few advantages among of many are listed below.

- **Skillful Dosing:** ODTs offer precise dosing, easy portability, and simple manufacturing. They also exhibit good physical and chemical stability. As a unit solid dosage form, they are an ideal substitute for pediatric and geriatric patients.
- **Enhanced Bioavailability:** The bioavailability of the drug is increased due to absorption in the oral cavity.
- **Quick Action:** ODTs provide a rapid onset of therapeutic action, as the tablet disintegrates quickly and the drug dissolves and absorbs swiftly in the mouth.
- **Enhanced Palatability:** ODTs have a pleasant mouthfeel, with taste-masking techniques applied to overcome the bitter taste of drugs, making them especially suitable for pediatric patients.
- **Patient Compliance:** Since ODTs do not require water for swallowing, they are convenient for patients who are traveling and may not have immediate access to water.
- **Ease of Administration:** ODTs are easy to administer, making them suitable for geriatric, pediatric, and disabled patients.
- **Safety:** There is no risk of suffocation or airway obstruction due to their physical properties, thus ensuring improved safety and comfort.

Limitations of Oral disintegrating tablets

Although there are so many advantages of ODTs in comparison with conventional dosage forms, there are some limitations too. Some major of these limitations are mentioned below **(Arora & Sethi, 2013)**.

- **Handling:** ODTs often exhibit inadequate mechanical strength, necessitating careful handling during storage and administration.
- **Unpleasant Taste:** Improperly formulated Oral Disintegrating Tablets can leave a gritty sensation in the mouth or an unpleasant taste.

Disintegrating Agents

Disintegrating agents are essential components in compressed Oral Disintegrating Tablets (ODTs) as they primarily facilitate rapid disintegration in the oral cavity. In ODT systems, substances with disintegrating properties include superdisintegrants, natural superdisintegrants, or effervescent systems. Combining different disintegrating agents is often preferred to achieve optimal disintegration results, with effervescent systems such as citric acid and sodium bicarbonate being particularly effective. When these effervescent agents encounter moisture, the release of carbon dioxide helps break down the tablet matrix. Manufacturers must carefully adjust the amount of effervescent ingredients used in formulations to avoid any unpleasant sensations or unexpected fizzing effects in the mouth.

Super disintegrants:

In recent years, several advanced agents known as superdisintegrants have been developed and manufactured. These superdisintegrants excel at rapidly breaking down the compact mass of tablets when exposed to a fluid environment. They are characterized by their high porosity and uniform distribution within the tablet matrix. Superdisintegrants demonstrate exceptional effectiveness even at low concentrations, enhancing disintegration efficiency and reducing mechanical energy requirements. Upon contact with moisture, superdisintegrants rapidly swell and generate significant internal pressure, causing rapid disintegration and foam formation. High-quality superdisintegrants exhibit excellent compressibility, compatibility with other ingredients, and inertness, making them ideal for use in high-dose formulations requiring strong mechanical integrity. (Chimombe, Mukhopadhyay, Han, & Wu, 2019). In most Oral Disintegrating Tablets, superdisintegrants such as croscarmellose sodium, crospovidone, and sodium starch glycolate are commonly used. These superdisintegrants offer significant benefits even at low concentrations typically ranging from 2-5%. Increasing the amount of superdisintegrants beyond this range is unnecessary for achieving faster disintegration. Superdisintegrants are inherently hygroscopic, facilitating

the absorption of water from saliva into the tablets. They are responsive to the presence of water, making them a preferred choice over effervescent systems for ensuring rapid tablet disintegration.

Mechanism of Oral Disintegrating Tablet

There are various mechanisms for dissolving a drug in a saliva over the tongue. Some of these mechanisms are discussed below (Patel, n.d.).

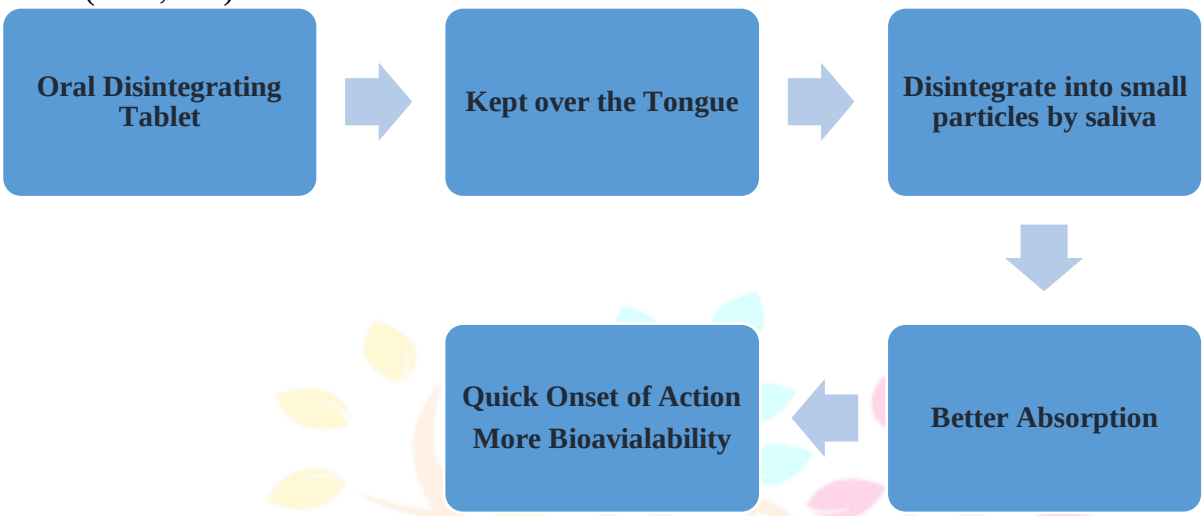

Figure I: Mechanism of disintegration of ODTs

- **Wicking (Porosity Capillary Action):** When liquid enters the tablet, it replaces the air that was initially absorbed. This process reduces the strength of intra-molecular bonds, leading to the breakdown of the tablet into smaller particles.
- **Swelling:** Swelling is a well-known mechanism for tablet disintegration. Tablets with high swelling forces typically disintegrate well, whereas those with low swelling forces may show poor disintegration. If the tablet's packing density is too high, fluids may struggle to penetrate, further hindering disintegration.
- **Particle Repulsion Forces:** According to Guyot-Hermann, the concept of particle repulsion involves non-swellable disintegrants in tablet swelling mechanisms. Water is necessary to create electric repulsive forces between particles.
- **Dislocation:** Sometimes, particles within a tablet become deformed during the compression process. Upon contact with a liquid medium or water, these deformed particles revert to their original shape.

2. MATERIALS AND METHODS

2.1. MATERIALS: List of all the items used in the formulation along with the source is listed as below.

Ingredients	Reference	Source
Telmisartan	IP	Hetero Drugs Limited
Sodium Hydroxide	IP	Ghanashyam Chemical Industries
Mannitol	IP	Jayanta Pharma
Isopropyl Alcohol	IP	Deepak fertilizers
Meglumine	USP	Parshwanath Life Sciences
Maize Starch	IP	Nitika Pharma
Sodium Lauryl Sulphate	IP	Anaga Specialities
Colloidal Silicon Dioxide	IP	Jayanta Pharma
Crospovidone	IP	J H Nanhang
Croscarmellose Sodium	IP	Prachem Chemicals
Sodium Bicarbonate	IP	Nitika Pharma
Kyron T-314	USP	C D Chemicals
Sodium Stearyl Fumarate	BP	Nitika Pharma
Sodium Starch Glycolate	IP	Nitika Pharma
Saccharin Sodium	IP	Roha chemicals

Table I: Materials used along with the source

2.2. METHODS

Identification: Telmisartan in tablet form is identified using HPLC chromatography. The principal peak of the test sample is compared to a reference solution to confirm identification, ensuring corresponding peaks.

Preformulation Studies: Organoleptic characteristics such as description, taste, odor, and color were carefully studied to obtain physical data.

Melting Point Determination: The drug's melting point was determined using the capillary method. A small quantity of the drug was placed in a sealed capillary tube, then heated in a melting point apparatus to note the temperature range at which it melted.

Preparation of oral disintegrating Tablet of Telmisartan:

Telmisartan (80 mg) was prepared using different ratio of superdisintegrants by slurry preparation and then compression after proper granulation. The superdisintegrants such as croscarmellose sodium, crospovidone, were used in different amounts.

Sodium Hydroxide is dissolved in purified water, where Telmisartan is added along with IPA with continuous stirring until it becomes slurry and after that aerosil-200 is added. All the remaining materials are passed through sieve number 60 and were subjected for drying to remove the moisture content at 60 ° C. Granules were shifted through mesh number 24. Lubrication is done using sodium bicarbonate, sodium lauryl sulphate, sodium stearyl fumarate and Kyron T-314. Weighed amount of drug and excipients were mixed for 15 min manually in mortar pastle. The mixed portion of drug and the excipients was subjected to compressed on single punching machine.

Ingredients	Formulation code				
	F1	F2	F3	F4	F5
Telmisartan	80	80	80	80	80
Mannitol	93	93	93	93	93
Crospovidone (mg)	27	23	23	21	19
Saccharin Sodium (mg)	5	5	5	5	5
Sodium Starch Glycolate (mg)	4	6	6	6	8
Maize starch	75	75	75	75	75
Aerosil-200 (mg)	12	12	12	12	12
Croscarmellose sodium (mg)	23	25	25	27	27
Sodium Lauryl Sulphate (mg)	7	7	7	7	7
Sodium Hydroxide (mg)	9	9	9	9	9
Sodium Bicarbonate (mg)	30	30	30	30	30
Sodium Stearyl Fumarate (mg)	7	7	7	7	7
Kyron T-314 (Polacrilin Potassium)	18	18	18	18	18
Total Weight of Tablet	**390**	**390**	**390**	**390**	**390**

Table II: Formulation for ODT with different concentrations of superdisintegrants.

Evaluation parameter of oral disintegrating tablets:

Pre-compression evaluation parameter of powder mixture:

Angle of repose (θ):

There is an empirical relationship between angle of repose and the ability of the powder to flow. Powder flow affects both the quality and quantity of the tablets produced. One of the factors leading to consistence in weight, hardness and content uniformity in tablets is good powder flow characteristics (Shah, Tawakkul, & Khan, 2008). It was determined using fixed funnel method. The funnel height was maintained in such a way so that the tip of the funnel should just come in contact with the apex of the pile which is the combination of powders Pre-compression mixture. The mixture combination of powders was allowed to flow freely by such way that drops in the funnel on top of the surface. The diameter units and radius of the cone or the pile of powder combination mixture and

calculation of angle of repose is done by the equation given below.

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

Where, h = height of the tip of powder from the base
r = radius of the cone

Bulk Density:
Apparent bulk density was determined by pouring pre-sieved drug excipient blend into a graduated cylinder and measuring the volume and weight "as it is". It is expressed in g/cm^3.

Tapped Density:
It was determined by placing a graduated cylinder, containing a known mass of drug excipient blend, on mechanical tapping apparatus. The tapped volume was measured by tapping the powder to constant volume. It is expressed in g/ml.

Cars Index (I):
It is expressed in percentage and is expressed by

$$I = (Dt - Db)/ Dt.$$

Where, Dt is the tapped density of the powder Db is the bulk density of the powder.

Hausners Ratio:
It is expressed in percentage and is expressed by

$$H = Dt/ Db \times 100.$$

Where, Dt is the tapped density of the powder Db is the bulk density of the powder.

Post compression evaluation parameter of tablets (Gupta, Mittal, & Jha, 2012) (Felton, 2013):
Tablet Hardness: Hardness of the tablets was determined by using a Monsanto hardness tester. Three tablets from each batch were selected randomly and tested. The percentage deviation was calculated.

Uniformity of Weight: The weight variation test was done by taking twenty tablets weighed individually and collectively and the average weight was determined. The percentage deviation was calculated and checked for weight variation (Not More Than 5%).

Friability Test: The friability of the tablets was using the Roche friabilitator for 4 min with the drum rotating at a speed of 25 rpm. Twenty tablets were weighed before and after the measurement and the weight loss was calculated (n = 1). The percentage deviation was calculated and checked for friability testing. Percentage friability was calculated for each batch by using following formula (Lachmen, Lieberman, & kanig, 1986).

$$\text{Friability \%} = \frac{\text{Initial Wt.} - \text{Final Weight}}{\text{Initial Wt.}} \times 100$$

Disintegration Test: In the disintegration test for Oral Disintegrating Tablets, the disintegration apparatus is used without closing the mouth of plastic disks, and the acceptable time limit is 2 min for tablet disintegration. So all of our formulations meet the requirement for disintegration. The rapid and desired disintegration of tablets is due to the presence and good proportion of CCM, SSG, and CP, as well as sodium Bicarbonate.

Wetting time: A circular tissue paper of 10 cm diameter was placed in three petridish with a 10cm diameter, one in each after folding. 10 ml of simulated salivary solution (phosphate buffer pH 6.8) was poured into the tissue paper placed in the petridish. A tablet was placed carefully on the tissue paper surface. The time needed for the solution to arrive the upper surface of the tablet was recorded as the wetting time. The percentage deviation was calculated and results were tabulated.

Tablet Thickness: Five tablets were taken and their thickness was measured using Vernier caliper. The thickness was measured by placing tablet between two arms of the Vernier calipers. The percentage deviation was calculated

and results were tabulated

Water absorption ratio: A circular tissue paper of 10cm diameter was placed in three petridish with a 10cm diameter, one in each after folding. 10 ml of simulated salivary solution (phosphate buffer pH 6.8) was poured into the tissue paper placed in the petridish. Three tablets were weighed individually and placed one in each petridish. Fully wetted tablets were weighed individually. The water absorption ratio was calculated for every batch. The percentage deviation was calculated and results were tabulated.
The water absorption ratio R was determined according to the following formula.

$$R = \frac{(Wa - Wb)}{Wa} \times 100.$$

Where Wb is the weight of the tablet before keeping in the petridish and Wa is weight of Fully wetted tablet.

3. RESULT AND DISCUSSION:

A total 5 formulations of fast dissolving tablet of Telmisartan were made by wet granulation and then compression using super-disintegrants such as sodium starch glycolate, crospovidone and croscarmellose sodium in different ratios. During the preparation, the lubricating agent and sweetening agent were kept constant to avoid any possible influence by these ingredients. Saccharine sodium which is used as sweetening agent to mask the bitter taste of drug may be helpful for increasing the patient compliance.

3.1 Preformulation parameters

Pre-formulation study results:

Organoleptic characteristics:

The Organoleptic physical characteristics were studied carefully and the results are shown in the table III.

S. No.	Properties	Results
1	Description	Amorphous powder
2	Taste	Bitter
3	Odour	Odourless
4	Colour	White powder

Table III: Organoleptic characteristics of Telmisartan

Solubility:

S. No.	Solvents	Mg/ml	Remarks
1	Water	10000	Insoluble
2	Ethanol	110	Soluble
3	0.1 N HCL	9	Freely soluble
4	Phosphate Buffer pH 6.8	0.6	Very Soluble
5	Phosphate Buffer pH 7.4	0.9	Very soluble

Table IV: Solubility profile

Identification

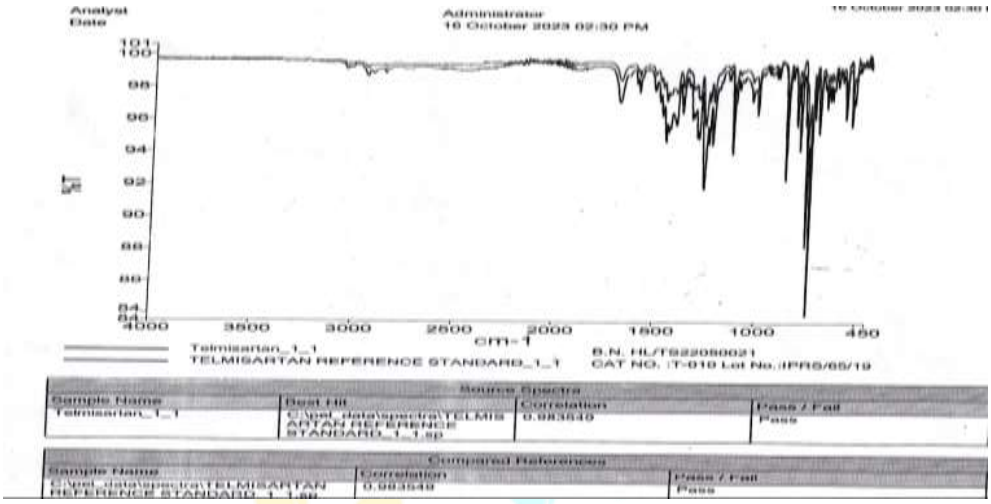

Fig II: Fourier Transform Infra-Red Spectrum of Telmisartan

Calibration Curve:

Calibration Curve of Telmisartan was prepared by using 6.8 pH Phosphate buffer in UV with λmax = 277 nm

Conc. (µg/ml)	**Absorbance (nm)**
0	0.000
2	0.167
4	0.311
6	0.455
8	0.592
10	0.764
12	0.879
14	0.946

Table V: Calibration Curve of Telmisartan

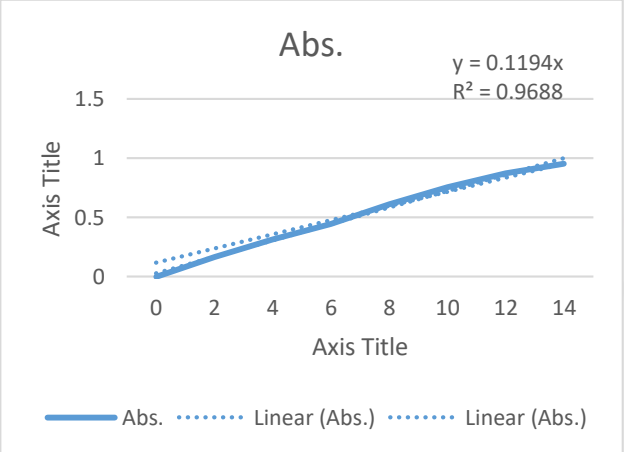

Fig III: Standard Curve of Telmisartan

Line of equation: y= 0.1194x
Beer's range: 2-14µg/ml
R^2 value: R^2= 0.9688
ƛmax: 242nm

3.2. Evaluation of Preformulation Parameters

Pre-compression parameters of Telmisartan:

Formulations	Angle of Repose	Bulk Density	Tapped Density	Carr's Index	Hausner Ratio
F1	27.82	0.41	0.44	6.82	1.07
F2	27.23	0.41	0.44	6.82	1.07
F3	25.59	0.38	0.41	7.32	1.08
F4	26.01	0.39	0.41	4.88	1.05
F5	27.55	0.42	0.45	6.67	1.07

Table VI: Preformulation parameters.

The frictional force in powder blends can be measured by angle of repose. The angle of repose for the powder blend was found to be in the range 25.59 to 27.82.

Interparticulate interactions influence the bulking properties of powder. A comparison of bulk density and tapped density can give a measure of relative importance of the interaction in a given powder; such a comparison is often used as an index of ability of the powder to flow. The bulk density of powder formulation was in range of 0.38 to 0.42. The tapped density was in range of which indicate that powder was not bulky. Carr's index was found to be in range of 4.88 to 7.32 that indicate the good compressibility of powder. (Lumay, et al., 2012)

Evaluation of Compressed Tablet:

Weight variation of the powder was performed as per Indian Pharmacopoea 2001 (IP); the test ensured that the fill in the die cavity was uniform for all the batches. Deviation within the IP allowed limit of 5.0% is permissible.

Formulation	Average Weight of Tablet in mg (20 Tabs)	Hardness (N)	Thickmess (mm)	Disintegration time (Sec)	Wetting time (Sec)
F1	391.05	21	4.56	33	32
F2	390.32	23	4.35	29	27
F3	391.51	21	4.85	22	19
F4	390.57	22	4.33	17	14
F5	392.12	25	4.95	23	20

Table VII: Pre compression parameter of Telmisartan

Improvements were done through the compression of tablet to get uniform weight. The percent deviation calculated was less than 5.0% of the average weight of the tablet. Hence all batches comply with the test for weight variation as per IP. The average thickness of tablets was recorded as 4.33-4.95. The friability of all the batches was found less than one percent, thereby all the batches were found to pass the test for friability of the tablet. The hardness of all the batches found to be 21 N - 25N.

The disintegration test was performed as per IP. The disintegration time range for all batches was found to be 17 sec. to 33 sec. Among the various batches, formulation made with the combination of crospovidone, Croscarmellose Sodium, and sodium starch glycolate. F4 formulation has the least disintegration time of 17 s. whereas, formulation F1 had less amount of micro crystalline cellulose showed increased disintegration time 33 sec.

Wetting time test was performed to find out the time taken for the water to wet the whole tablet and the wetting time range for all batches was found to be in the range of 14 sec. to 32 sec.

***In-Vitro* Drug Release Study**

In-vitro drug release of the sample was carried out using USP type 2 dissolution apparatus (paddle type). One Telmisartan tablet was subjected in each flask of dissolution apparatus. The dissolution apparatus was permitted to run for 120 min. Sample measuring 5 ml were withdrawn after every 5 minute and the time units considered are 5, 10, 20, 40, 60, 90, 120 min. The new dissolution medium was replaced every time with the equal quantity.

Time (Hr)	Formulations				
	F1	F2	F3	F4	F5
0	0	0	0	0	0
2	33.25	43.12	39.21	43.97	38.19
4	52.65	51.42	50.64	65.23	59
6	59.45	58.17	63.7	77.12	74.5
8	64.52	65.08	75.02	89.31	84.12
10	71.15	72.91	83.12	94.32	89.52
12	84.12	81.03	91.61	97.12	95.13

Table VIII: Drug release of five formulations

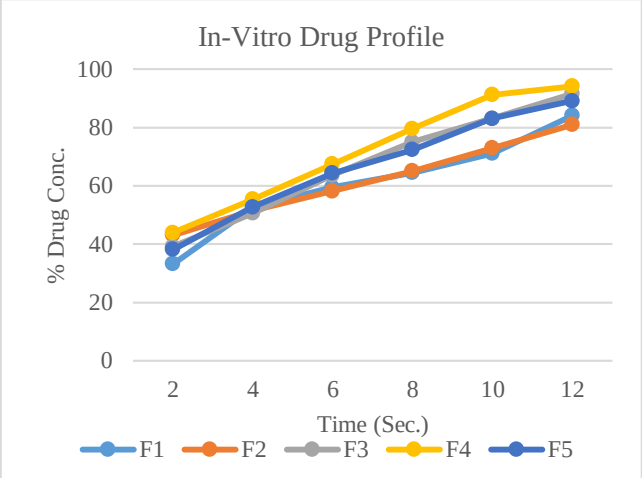

Figure IV: In-Vitro drug release profile of all formulations

All the formulations were to subject to in-vitro dissolution studies and the percentage of the drug release was calculated and fig represents the in- vitro release profile for formulation F1 to F5. Among the 5 formulation high percentage of drug release in F4 and F5 formulation was found to be 97.12% and 95.13% respectively in 12 min and disintegration time was found to be 17sec. and 23 sec. respectively. The formulation F1 containing less amount of superdisintegrant Croscarmellose Sodium show low percentage of drug release when compare to F4 and F5 formulation. In presence of dry binder starch the formulation F2 showed low percentage of drug release 81.03% as compare to F4 formulation. The result from the formulation F1 to F5 are not encouraging when compare to the formulation F5 and F4 but due to less percentage of crospovidone, F5 has less dissolution rate as compared to F4. So we took F4 as a best formulation. Regression value of the formulation F4 for first order kinetic (0.993) is higher and almost near to 1, than zero order kinetics (0.850). This confirms that drug release kinetics follow first order kinetics. Similarly, various model have been studied for analyzing release pattern of drug.

Drug release Kinetics model for dissolutions

Graphs from such kinetic models have been mentioned below with the respective regression for F4.

Figure V: Graph showing zero order drug release

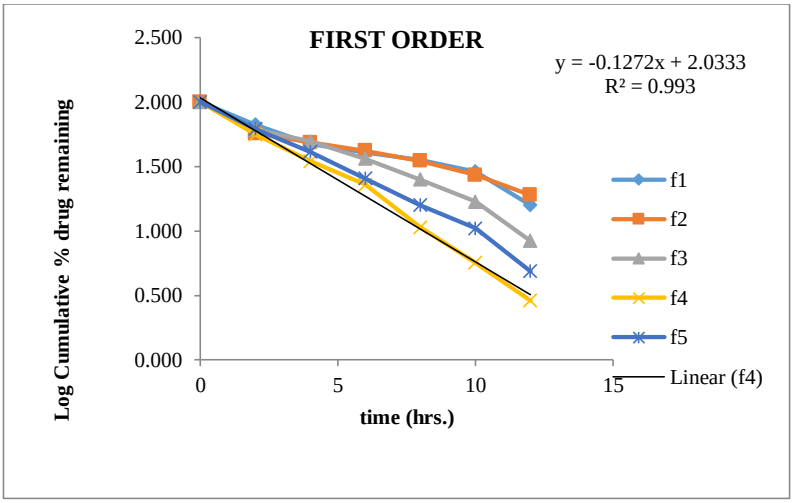

Figure VI: Graph showing First order kinetics

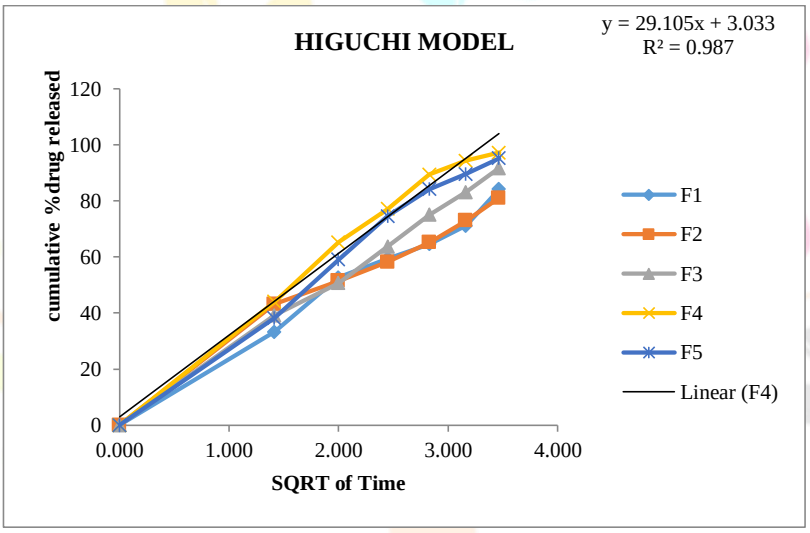

Figure VII: Higuchi model for drug release for all formulations

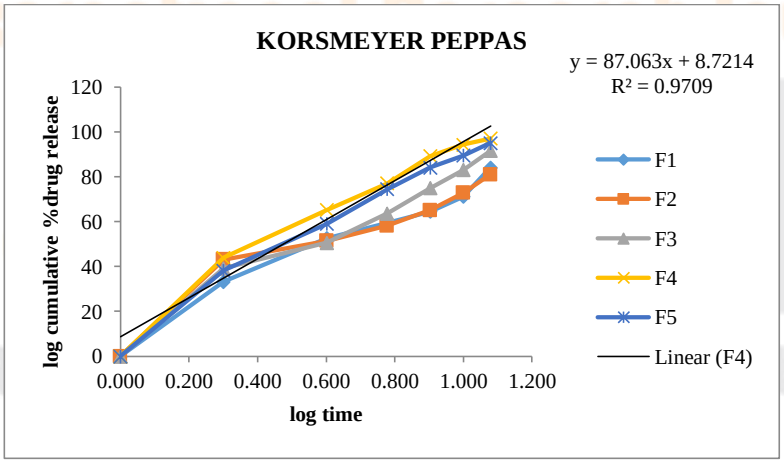

Figure VIII: Korsmeyer-Peppas Model for drug release

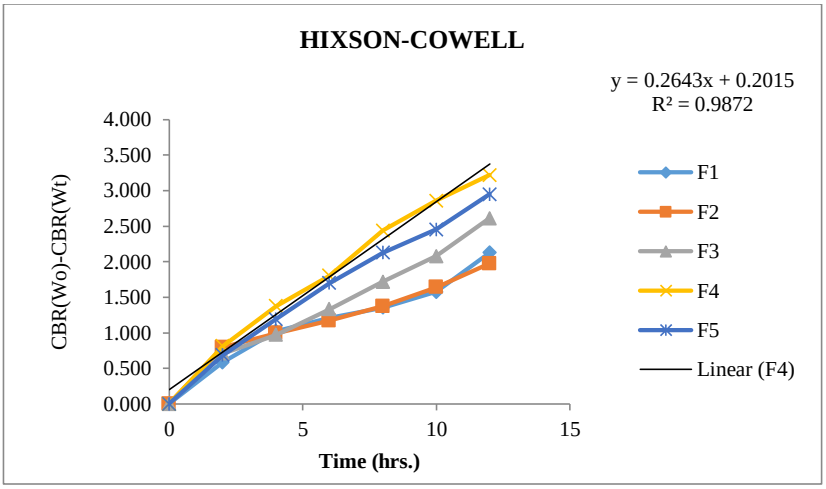

Figure IX: Hixson-Crowell of Hixson-Crowell model for Drug release

CONCLUSION:

A total 5 formulations of oral disintegrating tablet of Telmisartan (80mg) were prepared by slurry method using super-disintegrants such as croscarmellose sodium, sodium starch glycolate and crospovidone in different ratios. The study was performed with the aim to formulate and evaluate Fast dissolving tablet of Telmisartan. The bulk density of powder formulation was in range of 0.38-0.42. The tapped density was in range of which indicate that powder was not bulky. The carr's index was found to be in range of 4.88 to 7.32. indicate the good compressibility of powder. The average thickness of tablets was recorded as 4.33 to 4.95mm. The hardness of all the batches found to be 21 to 25 N. The disintegration time range for all batches was found to be 17 sec. to 33 sec.

The wetting time and disintegration time found to be less in F4 formulation and F4 formulation had high in-vitro release among all the formulation and satisfied best results in each evaluation. Therefore, F4 is a best formulation.

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