ejpmr, 2024, 11(6), 297-302

SJIF Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

FORMULATION AND EVALUATION OF MOUTH DISSOLVING TABLET OF TOPIRAMATE

Prof. Perane Kartiki Sambhaji*, Waghmare Priyanka Thomas, Walke Utkarsha Anil and Zuge Saurabh Govardhan

Department Of Pharmaceutics, S.V.N.H. College of B.Pharmacy, Shri Shivajinagar (Rahuri Factory), Tal-Rahuri Dist-Ahmednagar, MS, India-413705.

***Corresponding Author: Prof. Perane Kartiki Sambhaji**

Department of Pharmaceutics, S.V.N.H. College of B.Pharmacy, Shri Shivajinagar (Rahuri Factory), Tal-Rahuri Dist-Ahmednagar, MS, India-413705.

Article Received on 06/04/2024 **Article Revised on 27/05/2024** **Article Accepted on 17/05/2024**

1. ABSTRACT

This study aimed to formulate and evaluate mouth dissolving tablets of topiramate, an anti-epileptic drug, using wet granulation method. Six batches (F1-F6) were prepared with varying super disintegrants (Crospovidone and Sodium Starch Glycolate) and binders (Methyl Cellulose and Starch). The granules were evaluated for Angle of Repose, Tapped Density, Bulk Density, Hauser Ratio, and Carr's Index. Tablet evaluations included Hardness Test, Friability Test, Dissolution Test, Content Uniformity, Disintegration Test, Thickness, Weight Variation, Size, and Shape. Disintegration times ranged from 25 to 46 seconds, and in-vitro dissolution studies showed percentage release ranging from 67.23% to 95.84%. The tablets aimed to improve patient compliance, rapidly disintegrate, and release drug in saliva, obviate water requirement, cater to paediatric and geriatric patients, avoid first-pass metabolism, ensure high bioavailability, and achieve rapid onset of action.

KEYWORDS: Mouth Dissolving Tablet, Anti-Epileptic,Anti-Convulsant,

2. INTRODUCTION

Mouth dissolving tablet (MDT): - It is a tablet that disintegrates and dissolves rapidly in the saliva within a few seconds without the need of drinking water or chewing. A mouth dissolving tablet usually dissolves in the oral cavity within 15 s to 3 min. Most of the MDTs include certain super disintegrants and taste masking agent. According to European pharmacopoeia, these MDTs should dissolve/disintegrate in less than three minutes. US FDA defined MDTs as "A solid dosage form containing medicinal substances or active ingredients which disintegrates rapidly within a few seconds when placed up on tongue. These are novel types of tablets that dissolve/ disintegrate/ disperse in saliva with in few seconds without water. The formulation is more useful for the bed-ridden. and patients who have the swallowing problem. The benefits of MDTs are to improve patients' compliance, rapid onset of action, increased bioavailability and good stability which make these tablets popular as a dosage form of choice. in the current market. Mouth dissolving tablets are also called as or dispersible tablets, fast disintegrating tablets, orally disintegrating tablets, quick disintegrating tablets, fast dissolving tablets, rapid dissolving tablets, porous tablets, quick melt tablets and rapid melt tablet. Mouth dissolving tablets are formulated mainly by two techniques first use of super disintegrants like croscarmellose sodium, sodium starch glycolate and cross povidone. Another method is maximizing pore structure of the tablets by freeze drying and vacuum-drying. The bioavailability of some drugs may be increased due to absorption of drugs in oral cavity and due to pre-gastric absorption of saliva containing dispersed drugs that pass down in to the stomach. Moreover, the amount of drug that is subjected to first pass metabolism is reduced as compared to standard tablets.

2.2 MECHANISM OF SUPERDISINTEGRATION OF MOUTH DISSOLVING TABLET

There are four major mechanisms for tablets disintegration as follows:

1. **Swelling:** The most widely accepted general mechanism of action for tablet disintegration is swelling. Tablets with high porosity show poor disintegration due to lack of adequate swelling force. On the other hand, sufficient swelling force is exerted in the tablet with low porosity.

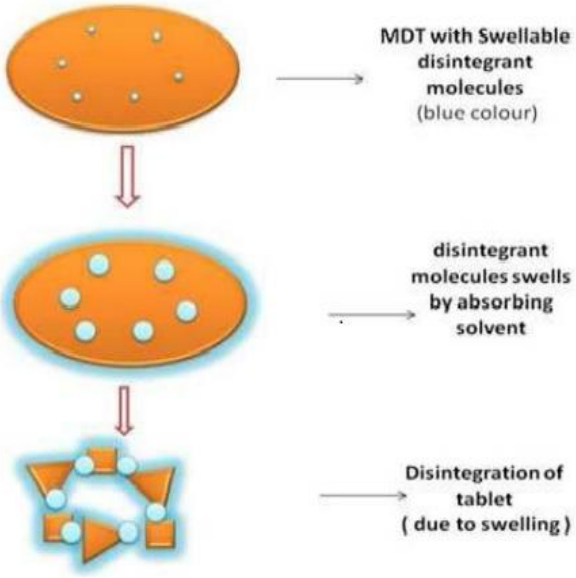

Fig. 1: Mechanism of Swelling.

2. Porosity and capillary action (Wicking): When we put the tablet into suitable aqueous medium, the medium penetrates into the tablet and replaces the air adsorbed on the particles, which weakens the intermolecular bond and breaks the tablet into fine particles. Water uptake by tablet depends upon hydrophilicity of the drug /excipient and on tableting conditions. For these types of disintegrants maintenance of porous structure and low interfacial tension towards aqueous fluid is necessary which helps in disintegration by creating hydrophilic network around the drug particles.

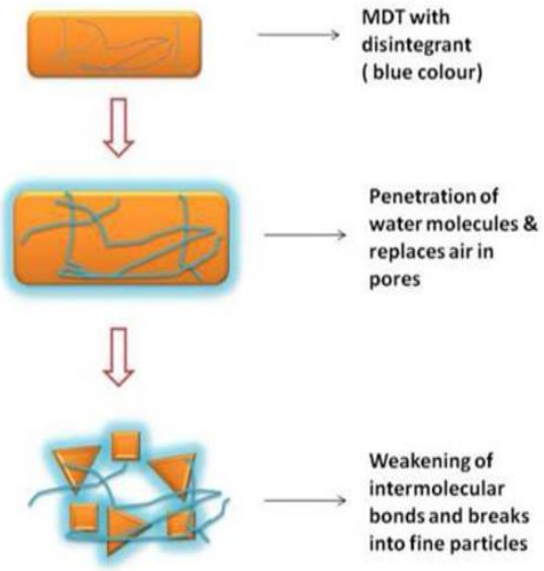

Fig. 2: Wicking Mechanism.

3. Repulsion Mechanism: Another mechanism of disintegrant attempts to explain the swelling of tablet made with non-swellable disintegrants. Guyot-Hermann has proposed a particle repulsion theory based on the observation that no swelling particle also causes disintegration of tablets. The electric repulsive forces between particles are the mechanism of disintegration and water is required for it. Researchers found that repulsion is secondary to wicking.

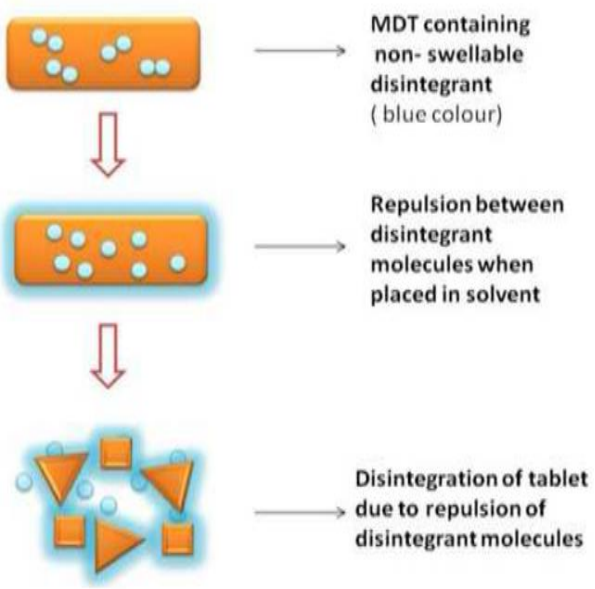

Fig 3: Repulsion Mechanism.

3. **Due to deformation:** During tablet compression, disintegrated particles get deformed and these deformed particles get into their normal structure when they come in contact with aqueous media or water. Occasionally, the swelling capacity of starch was improved when granules were extensively deformed during compression. This increase in size of the deformed particles produces a breakup of the tablet.

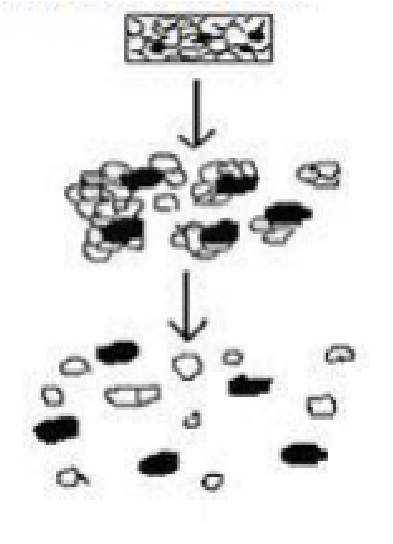

Fig. 4: Deformation Process.

6. MATERIAL AND METHOD

Table 1: List of material.

Sr.no	Material	Source
1.	Topiramate	Aurobindo Pharmaceutical Pvt. Ltd., Hyderabad
2.	Crospovidone	Thermosil Fine Chemicals Industries, Pune
3.	Sodium Starch Glycolate	Research Lab Fine Chemicals, Mumbai
4.	Fructose	Research Lab Fine Chemicals, Mumbai
5.	Magnesium Stearate	Hilab Chemicals, Shrirampur
6.	Methyl Cellulose	Research Lab Fine Chemicals, Mumbai
7.	Starch	Research Lab Fine Chemicals, Mumbai
8.	Menthol	Thermosil Fine Chemicals Industries, Pune
9.	Lemon Oil	Thermosil Fine Chemicals Industries, Pune

Table 2: List of Equipment.

Sr.no	Material	Manufacture	Model
1.	Electronic Balance	Wensar Weighing Scales Limited, Chennai	PGB 600
2.	UV-VIS Spectrometer	JASCO Corporation Tokyo Japan	V-630 Detector Photomultipliers tube
3.	Single Punch Tablet Punching Machine	Karnavati Engineering Limited, Gujarat	Single punch tablet compression machine (B Tooling)
4.	Monsanto Hardness Tester	Dolphine Pharmacy Instruments Pvt. Ltd, Mumbai	MHT-20
5.	Friability Tester	Bio Techno Lab, Mumbai	2594-B
6.	FTIR Spectrophotometer	Shimadzu Analytical (India) Pvt. Ltd (E), Mumbai -	Shimadzu-GC2014
7.	Dissolution Test Apparatus	DBK Instruments, Mumbai	50 LTA 02
8.	Disintegration Test Apparatus	DBK Instruments, Mumbai	40 LTA 01.
9.	Hot Air Oven	Lab-Star Instrument, Mumbai	BTL
10.	Differential Scanning Colorimetry (DSC)	Shimadzu Analytical (India) Pvt. Ltd (E), Mumbai	SHIMADZU-60-PLUS
11.	Tapped Density Apparatus	Expo Hi-Tech, Mumbai	EHT-68
12.	Standard Sieve	R.K Industries	60, 12 ,22,10

a) Methodology Employed for Mouth Dissolving Tablet Formulations

- **Wet Granulation Method**

It included the following steps

1. Accurately weighed the quantity of topiramate, super disintegrant, crospovidone, mannitol, lactose, and sodium starch gluconate were taken in a Mortar, mixed well, and sifted through 60 mesh sieves.
2. Materials were granulated with water.
3. The wet mass was sieved through 10 mesh screen and granules obtained were air-dried in the oven at 50 °C for 2 h. Dried granules were sifted through a 12-mesh screen.
4. Moisture contents of dried granules were controlled and maintained between 1-2 %.
5. Above blend with the target weight of 100 mg was compressed by using 6 mm normal concave punches and 1.5% Talc and 1.5% magnesium stearate was used as a lubricant. Tablets were prepared using the Single punch Tablet Punching Machine.

Table 3: Formulation of Mouth Dissolving Tablet.

Sr.no	Ingredients (mg)	F1	F2	F3	F4	F5	F6
1.	Topiramate	25	25	25	25	25	25
2.	Crospovidone	65	67	70	-	-	75
3.	Mannitol	325	328	337	330	336	318
4.	Sodium Starch Glycolate	-	-	-	75	77	-
5.	Fructose	5	5	5	5	5	5
6.	Magnesium Stearate	4.5	4.2	4.5	4.4	4.5	4.6
7.	Methyl Cellulose	-	-	8	10	12	-
8.	Starch	25	20	-	-	-	22
9.	Menthol	Q.S	Q.S	Q.S	Q.S	Q.S	Q. S
10.	Lemon Oil	Q.S	Q.S	Q.S	Q. S	Q. S	Q. S
11.	Total Weight in mg	450	450	450	450	450	450

3) RESULTS AND DISCUSSION

1. UV Spectroscopy Analysis

The absorbance maxima have been specified is determined by using UV. From the U.V analysis, it was concluded that the compound had shown λmax at 268nm.

The Calibration Curve graph was prepared using the formula

Y=Mx+C

Where m=Slope, X=Absorbance= PPM, C-Concentration.

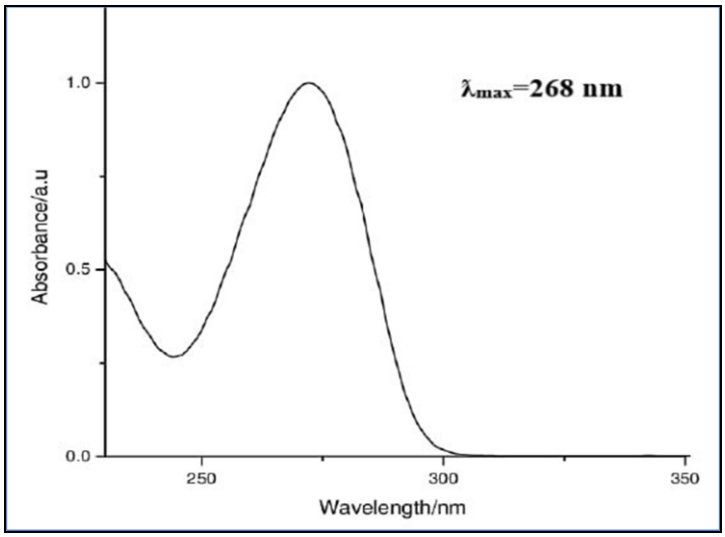

Fig. 1: U.V. Spectroscopic Analysis of Topiramate.

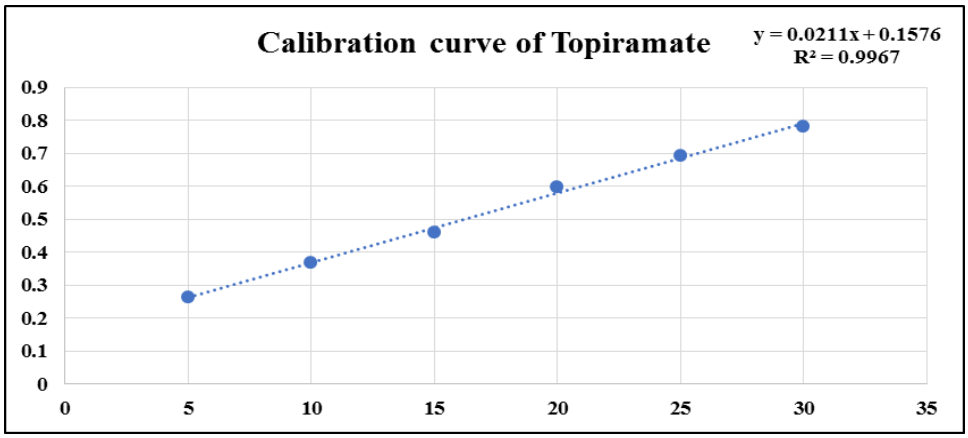

Fig. 2: Calibration Curve of Topiramate.

2. FTIR of Topiramate

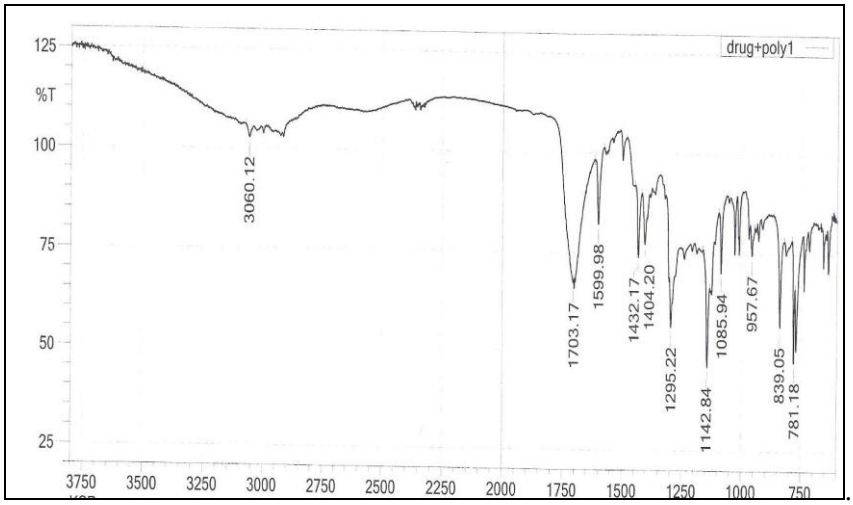

Fig. 3: FTIR of Drug + Excipient.

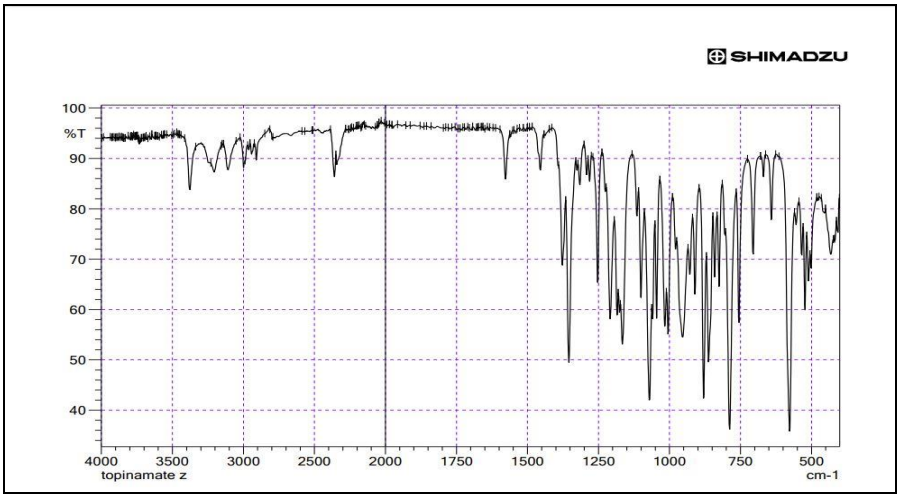

Fig. 4: FTIR of Topiramate.

4. DIFFERENTIAL COLOURIMETRY SCANNING OF TOPIRAMATE

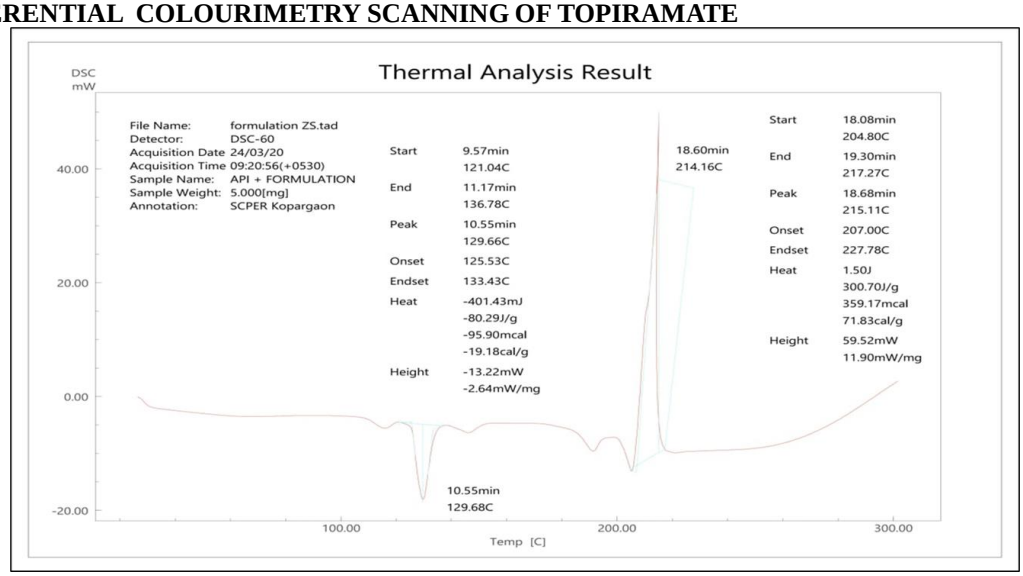

Fig. 5: DSC OF TOPIRAMATE DRUG.

4. IN-*VITRO* DISSOLUTION STUDY OF TOPIRAMATE MDT

The drug release of formulations prepared with super disintegrants by the wet granulation method was performed by dissolution apparatus, the results were shown in Table 1 and fig no 6. From the results, it was found that as the formulation F3 showed maximum release. The formulation F2 shows 97.84% drug release in 15 min.

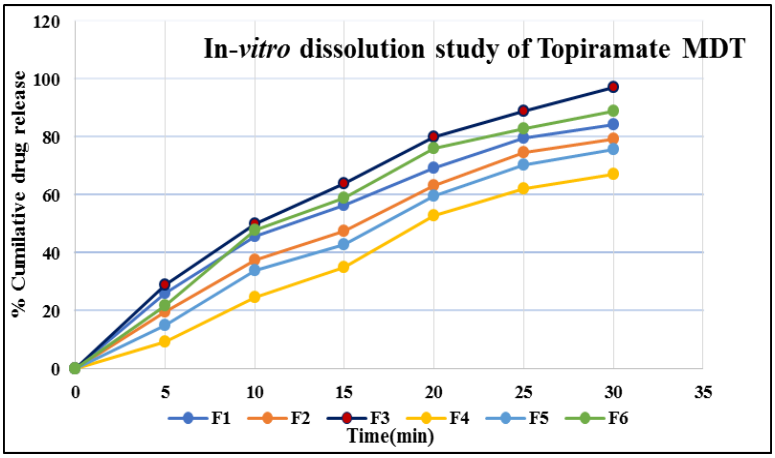

Fig. 6: In -*vitro* Dissolution Study Graph of Topiramate.

Table 4: In-*vitro* dissolution study of Topiramate MDT.

Formulation code	Cumulative percent release
F1	84.23±0.358
F2	79.25±0.417
F3	97.84±0.145
F4	67.23±0.398
F5	75.90±0.487
F6	89.67±0.589

4. CONCLUSION

The formulation and evaluation of topiramate mouth dissolving tablets exhibited promising results in terms of disintegration time, dissolution rate, and other parameters. The selection of super disintegrants and binders significantly influenced the tablet characteristics, with Cross povidone and Methyl Cellulose demonstrating favourable outcomes. The developed tablets hold potential for enhancing patient adherence, particularly in populations such as paediatric and geriatric patients, by providing a convenient dosage form that rapidly disintegrates in the oral cavity. Moreover, the avoidance of first-pass metabolism and rapid onset of action further underscore the therapeutic advantages of these tablets in epilepsy management. Future studies could focus on optimizing formulation parameters to fine-tune the tablet properties and ensure consistent performance.

5. REFERENCES

1. Lachman L, Liberman HA, Kanig JL. The theory and practice of industrial pharmacy. Tablets, Edition, 1990; 3: 293-335.
2. Ahmed JA. A Review on mouth dissolving tablet dosage form. International Journal of Pharmacy and Pharmaceutical Research, 2015; 2(3): 1-17.
3. Tiwari AK, Shah A, Rajpoot A, Manmohan Singhal. Formulation and In-vitro Evaluation of mouth dissolving tablets of Drotaverine HCl. J. Chem. Pharm. Res., 2011; 3(4): 333-341.
4. Rai VK, Pathak N, Bhaskar R, Nandi BC, Dey S, Tyagi LK. Optimization of mouth dissolving tablet of Raloxifene hydrochloride by wet granulation method. Int J Pharm Sci and drug Res., 2009; 1(1): 51-54.
5. Sahoo CK, Sudhakar M, Bhanja S, Panigrahy UP, Panda KC. Development and evaluation of immediate release tablets using sodium starch glycolate as super disintegrants, In original International Journal of Sciences, 2017; 4(1): 1.
6. Deformation process reference- Arijit Gandhi, 1 No. 8 2012 www.thepharmajournal.com, 18.