Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

FORMULATION AND EVALUATION OF MECLIZINE HYDROCHLORIDE MOUTH DISSOLVING FILMS

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ABSTRACT:

The objective of this research was to formulate and evaluate Meclizine Hydrochloride (MCZ) mouth dissolving films (MDFs) to overcome the impediments associated with the administration of oral route dosage forms such as tablets and capsules especially for age-specific patients like pediatrics and geriatrics. In the formulation of MDFs, various viscosity grades of Hydroxy propyl methyl cellulose (HPMC) E3, E5, E15 were used as a film-forming agent. PEG 400 and glycerol were used to enhance the plasticity of MDFs and Poly vinyl pyrrolidine (PVP), Sodium lauryl sulphate (SLS) as solubilizing agents. MDFs were prepared in Petri plates using the solvent casting method. FTIR studies confirmed that no interactions between MCZ and excipients were used in MDFs. DSC studies showed the absence of MCZ recrystallization within the MDFs. SEM analysis confirmed that MCZ was in a dispersed state within the MDFs. The formulated MDFs were examined for physical characteristics such as weight variation, thickness, loss of drying, mechanical properties (folding endurance), and chemical properties like MCZ content, *in vitro* disintegration time, and *in vitro* drug release studies. Overall, the MDF fabricated with polymer HPMC E3 in a combination of PVP and PEG showed a better result of MCZ release about 98.05% within 5 minutes compared to other formulations.

KEYWORDS: Meclizine HCl, Mouth Dissolving Films, Polymer viscosities, Solubilizing agent, and Dissolution studies.

1. INTRODUCTION:

Patient consumption is often used to describe drug products with characteristics that meet the need of consumer groups. When compared to other routes of administration, oral route pharmaceutical preparations such as tablets, chewable formulations have been assessed for their patient acceptance features [1]. However, an integrated approach towards patient agreeability testing has not yet been fulfilled. In this context, Mouth dissolving films (MDFs) are unique formulations and a preferable path that were introduced for providing an easy and convenient means of drug administration [2]. MDFs are solid dosage forms on contact with saliva, it disintegrates or dissolves rapidly (<1 minute) when placed in the mouth, without drinking or chewing. MDFs after sublingual or buccal delivery goes directly to the systemic circulation, resulting in rapid drug absorption and improved bioavailability via avoidance of first-pass metabolism. For simple and ease of administration without water, oral films can provide fast drug action resulting from the swift disintegration and drug release from the dosage forms [3].

MDFs are thin and flexible layer of polymer with or without a plasticizer. Since they are thin and flexible by their nature, they can be more agreeable to the patient [4]. MDFs have shown the capacity to enhance the onset of drug action and improve drug efficacy. Compared with the current traditional dosage forms, it emerges out to be superior in terms of enhanced bioavailability and high patient compliance [5]. The wide availability of polymers and the underlying assumptions in manufacturing technology has made it possible to develop a wide range of thin films [6]. Therefore, MDFs are gaining reputation and affirmation in the pharmaceutical area as a novel drug delivery dosage form.

Ideal MDFs need to exhibit desirable features such as sufficient drug loading capacity, acceptable formulation stability, fast dissolution rate. In the development of MDFs handling procedures, packaging and maintaining tensile properties is a main critical issue [7]. However, in the present investigation, a requisite study on MDFs has been performed for the development of more adorable formulations of MCZ which is an effective anti-histamine.

Antihistamines are drugs that treat allergic rhinitis and other allergies which can give relief when a person has nasal congestion, sneezing, or hives because of pollen, dust mites, or animal allergy [8]. Generally, consumers who take antihistamines are inexpensive, generic, and over-the-counter drugs with few side effects. Antihistamines are usually for short term treatment only whereas chronic allergies may increase the risk of health problems such as asthma, sinusitis, and lower respiratory tract infections. Although people use the word “antihistamine” to explain drugs for treating allergies, whereas scientists use the term to describe a class of drugs that opposes the activity of histamine receptors in the body [9]. Antihistamines are sub-classified into the two largest groups H1-antihistamines and H2-antihistamines. H1 antihistamines are used to treat allergic reactions like runny nose, sneezing, and itching of the nose. H1-receptor antihistamines are also sometimes used for the treatment of motion sickness or vertigo. H2-antihistamines are used to treat gastric acid conditions (e.g., peptic ulcers and acid reflux) [10].

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MCZ is a first-generation antihistamine of the piperazine class drug, used in the treatment of motion sickness (H1 receptor antagonist) possesses anticholinergic, central nervous system depressant, local anaesthetic, and antivertigo effects [11]. MCZ is also a dopamine antagonist at D-1 and D -2 receptors but does not cause catalepsy, perhaps because of its anticholinergic activity.

Presently, MCZ is marketed in the form of chewable tablets (Bonamine, Bonine, etc.) and orally disintegrating tablets (CVS motion sickness fast-melting). Keeping in view of the patient compliance and need for better therapeutic efficacy and since no research work has been done on MCZ MDFs, the objective of the present study is preparation and evaluation of MCZ MDFs to ensure the quick onset of action with more therapeutic effect by enhancing dissolution.

There are various methods in formulating MDFs, in which Solvent Casting Technique is widely used as it is cost-effective, easy to manufacture the MDFs, and also enhances better mechanical properties of films without disturbing the flexibility of dosage form.

2. MATERIALS AND METHODS:

2.1. Materials:

MCZ was a gift sample from Aurobindo pharma (Hyderabad), HPMC E3, E5, E15 were obtained from Loba Chemie Pvt. Ltd, Methanol (Loba Chemie, Mumbai), SLS was purchased from Finar Chemicals Pvt. Ltd, PVP was a gift sample from Research lab fine chem industries, and other chemicals of analytical grade were used.

2.2. Preparation of Artificial Saliva Buffer:

Artificial saliva buffer was prepared by using ingredients like 0.844 gm of sodium chloride, 1.2gm of potassium chloride, 0.93 gm of calcium chloride, 0.11 gm of magnesium chloride and 0.342 gm of potassium phosphate added one by to 500mL of distilled water and make up the volume up to the mark by adjusting pH 5.7 with 0.1N hydrochloric acid [12].

2.3. Construction of calibration curve for MCZ:

Initially, 10mg of pure MCZ was weighed and dissolved into a 10 mL volumetric flask containing ethanol to completely dissolve the drug and make up the volume with artificial buffer and from that take 1 mL and dilute it with 10 mL of buffer which gives 100µg/mL solution. From this solution, subsequent dilutions were made and subjected for absorbance in UV-Visible Spectrophotometer at 230.5nm using pH 5.7 artificial saliva buffer as blank [13].

2.4. Preparation of MCZ MDFs:

The solvent Casting Technique was used to prepare MCZ MDFs. The drug was dissolved insufficient amount of methanol. Then polymer was completely dissolved in a suitable amount of water. Other ingredients like SLS, PVP, Glycerol, PEG400, flavouring and colouring agents are added one by one in a test tube containing distilled water. These three solutions were mixed vigorously and finally, this solution was cast on a petri dish and dried at room temperature for 8hours. The films were carefully separated from the petri dish, checked for any imperfections [14].

2.5. DSC Studies:

Thermograms of MCZ and MCZ MDFs were recorded using a differential scanning calorimeter (Shimadzu, DSC-60, Japan). Samples weighing 5 mg were sealed in aluminium pans and heated from 50-400ºC at the rate of 10°C per minute. The aluminium pan was used as a reference for DSC studies.

2.6. SEM Analysis:

SEM studies on formulated MDFswere done with the Scanning Electron Microscope. The samples were mounted onto aluminium stubs using carbon double-sided tape, gold coated with a sputter coater (Quarum sputter coater, SC7620, UK) and examined at an excitation voltage of 15kV.

2.7. FT-IR Studies:

FTIR studies were carried out using an ATR-FTIR spectrometer (Bruker, Germany). ATR spectra were measured over the wavenumber range of 4000-500 cm^{-1}at a resolution of 1.0 cm^{-1}. On ATR crystal sample powder was placed and the sample spectrum was collected.

2.8. EVALUATION PARAMETERS OF MOUTH DISSOLVING FILMS:

2.8.1. Morphological studies:

Properties such as homogeneity, colour, transparency, and the surface of MCZ MDFs were tested visually. Store all formulations at room temperature (25±3°C) with a relative humidity of approximately 65 ± 5% and were tested periodically for morphological properties. Then pack films in Aluminium foil pouches [15-16].

2.8.2. Variation of Mass:

The weight variation was performed to know the complete dispersion of the drug and other materials to the entire film. This was performed by taking 1x1 pieces of the film from three different regions. Each piece was weighed and the weight values were noted. The values should be equal for all the pieces which indicates that the drug and the excipients used are equally distributed to the entire film [17].

2.8.3. Thickness:

The thickness of the film was evaluated using a screw gauge with a range of 0-10mm and revolution 0.001 mm. A thickness gauge anvil was turned and the film was inserted after making sure that the pointer was set to zero. The film was held on the anvil and the reading on the dial was noted down. The thickness was measured at three different spots of the films and the average was taken with standard deviation values [18].

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2.8.4. Folding endurance:

Folding endurance provides the brittleness of the film. The film is folded repeatedly at the same of the film until it breaks. The measurements were carried out in triplicate. The film is folded several times without breaking is computed as folding endurance value [19]. A strip of film of a specific size (1x1 cm) was cut and repeatedly folded at the same place till it breaks. The film was folded at the same place until the film breaks.

2.8.5. MCZ content:

One cm^2 film was taken in a 100 ml volumetric flask and dissolved in 5 ml of artificial saliva buffer and then the final volume was made up with artificial saliva buffer. Absorbances of suitably diluted samples with artificial saliva and the absorbances were measured at 230.5 nm [19].

2.8.6. Disintegration Time:

The in-vivo disintegration was carried out using two methods. One is the Drop test method and the other is the Petri Plate method. For maintaining natural conditions minimum quantity of medium is required for both methods.

2.8.6.1. Drop Test Method:

The MDFs were placed on a glass slide and mounted on a Petri dish. By using a pipette, a drop of distilled water was dropped onto the MDFs. The time taken to dissolve film and cause a hole within a film was measured. The estimations were carried out in triplicate [20].

2.8.6.2. Petri Plate Test:

In a Petri plate drop 2 mL of distilled water and place 2x2 cm^2 film on the surface of the water and measure the time taken to dissolve the film completely. An average of three trials was performed to measure disintegration time [21].

2.8.7. Loss of Drying:

The MDFs were measured for their weight before and after drying at 50^0C in a hot air oven for 1hr to determine the presence of any residues of solvents used in the preparation of MDFs.

2.8.8. In vitro dissolution studies:

The in vitro dissolution studies were conducted using 500 ml of artificial saliva buffer as dissolution medium with modified type 5 dissolution apparatus with of temperature of 37^0C and 50 rpm was used. Each film with a dimension of an appropriate size equivalent to 20 mg of MCZ was placed on a watch glass covered with nylon wire mesh. Then dropped watch glass into dissolution flask. 5 ml samples were withdrawn at predetermined rate 5,10,15,30,45,60min time intervals and every time replaced with 5 ml of fresh dissolution medium. The samples were analysed by measuring absorbance at 230.5 nm.

3. RESULTS AND DISCUSSION:

3.1. Preparation of MCZ MDFs

The MDFs were prepared as per the formula given in Table 1. MDFs were prepared by using film-forming agents of various viscosity grades of HPMC like E3, E5, E15, and PEG, glycerol as a plasticizer and SLS, PVP as solubilizing agents.

Initially, 200mg of MCZ was added to the formulation and the MDFs were prepared. However, crystallization of MCZ was observed over a period of time upon performing SEM analysis. Hence, the quantity of MCZ was adjusted to 150mg per batch. Different homogenous MDFs of MCZ were prepared and the formulated MDFs were transparent, soft with no spots on them and easily peeled from petri plates.

3.2. Organoleptic Evaluation:

The primary characteristics of the active pharmaceutical ingredient were used in the observation of the individuality of the drug. Prepared MCZ MDFs were orange and blue due to the addition of colouring agent, all the films were smooth in texture and glossy in appearance.

3.3. DSC Studies:

To confirm the absence of MCZ recrystallization within the MDFs, the prepared MDFs were subjected to DSC studies. Thermogram of MCZ shown a sharp endothermic peak at 217^0C corresponding to the melting point of the drug indicating that MCZ exists in a single crystalline state. The result from DSC studies indicates that the MCZ was not in a crystalline state in MDFs. The results were shown in Fig 1.

3.4. SEM Analysis:

The scanning electron microscopy studies were performed on the sample HPMC E3+MCZ. Initial trails, the amount of MCZ was 200mg in MDFs. Over a period of time MCZ showed recrystallization within the MDFs. The result was shown in Fig 2 (A). Hence, further formulae of MDFs were prepared with adjusted amount of MCZ. SEM analysis confirmed that MCZ was in dispersed state within the MDFs after the adjusting formulae. The results of the SEM are shown in Fig 2 (B).

3.5. FT-IR Studies:

The compatibility between MCZ and different excipients used in formulations was studied using FTIR studies. The FTIR spectra of at 1150.48cm^{-1}(aliphatic C-N stretching), 3321.69cm^{-1}(aromatic secondary amine N-H stretching), 645.04cm^{-1}(C-S stretching), 1078.40cm^{-1}(S=O stretching). These characteristic peaks of Meclizine were all retained in the MDFs and no shift in major peaks was observed indicating that there is no interaction between MCZ pure drug and excipients in MDF formulations. The results were observed in Fig 3.

3.6. Weight Variation:

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Formulated films were subjected to weight variation with random batches. The same mass of film was obtained in each film of all formulation indicating reproducibility of the method of preparation and spreading ability of film. Weight variation result is in between the range of 6.3 to 18.5 mg. The weight variation values were given in the following Table 2.

3.7. Thickness:

From all formulations, MDFs were subjected to the thickness of dosage form. The thickness of the film was measured using thickness gauge and average thickness of all MDFs was found in between 50 to 60µm. All MDFs show a standard deviation of average thickness in the range 0-5% that may be due to good positioning during the solvent evaporation process and values were tabulated in Table 2.

3.8. Folding Endurance:

The folding endurance was performed to show the strength of the film. Along with tensile strength, folding endurance demonstrates the resistance of film towards mechanical forces during packing or transport. The average folding endurance of all MDFs was ranging from 30- 119. Folding endurance values were tabulated in Table 2.

3.9. MCZ content:

MDFs were subjected to determine the amount of MCZ and quantitatively measuring a dose. It was determined by the random sampling method. It was estimated as a mean of three determinations. The values were given in Table 2 and all formulations were within the limits of 35 to 85%.

3.10. Disintegration Time:

In the present investigation, the effect of film thickness, polymer viscosities, and solubilizing agents on *in vitro* disintegration of MDFs was studied. Studies were carried out using two independent methods drop test and petri dish methods to mimic the *in vivo* conditions. The results were given in Table 2. The results revealed that film thickness, polymer viscosities, and solubilizing agents had a significant effect on the disintegration of MDFs.

3.11. Loss of Drying:

Loss of drying (LOD) for MCZ MDFs was performed in a hot air oven. This test was performed to determine any residues were present in MDFs and moisture content determination. The results of LOD of MDFs were placed in table 2.

3.12. In-Vitro Dissolution Studies:

The in vitro dissolution studies were carried out in modified USP Type-V dissolution apparatus using pH 5.7 Artificial Saliva Buffer, temperature maintained at 37^0C and rpm of 50. It shows the cumulative percentage of drug release as a function of time for all formulations. The percent of MCZ dissolved at various time intervals were calculated and plotted against time and comparative profiles were shown in Fig. 4.

Various formulae of MCZ MDFs were prepared using HPMC E3, E5, and E15 as film-forming polymers varying surfactants like SLS and PVP for each polymer. To study the effect of film-forming agents on the release of MCZ formulations F4, F5, F6 were prepared with HPMC E3, E5, and E15 respectively. Formulation F4 shown more drug release compared to other polymer-containing formulations. As F4 contains HPMC E3 as a film-forming agent, due to the less viscous nature of E3 shown more MCZ release.

The studies were further continued to the effect of plasticizers used in the preparation of MDFs. Formulae F15 and F7 containing plasticizers PEG and glycerol respectively. MDFs prepared with PEG shown faster release compared to MDFs with glycerol. MDFs prepared with glycerol have slightly more thickness compared to MDFs with PEG so, there is a delay in the disintegration of MDFs.

The effect of solubilizing agents on MCZ release was studied. MDFs prepared with HPMC E3 F13 (PVP) and F 15 (SLS) solubilizing agent added in a quantity of 4 mg. The MDFs with surfactant PVP showed more release compared to SLS containing MDFs. At the end of 5 min PVP containing MDF showed 98.05% MCZ release.

Overall, from the results obtained, it was concluded that formulation F13 containing HPMC E3 as film-forming agent, PEG as a plasticizer, and PVP as solubilizing agent showed good physicochemical properties and more MCZ release compared to remaining formulations.

4. CONCLUSION:

The results of this research concluded that MCZ MDFs were formulated with a cost-effective method. The film thickness, solubilizing agents, and polymer viscosities showed a significant effect on the release of MCZ from MDFs. So, MCZ MDFs showed onset of action with improved oral bioavailability by enhancing solubility in consumers with good therapeutic activity, convenience, and self-administration.

ACKNOWLEDGEMENTS:

The authors would like to acknowledge Aurobindo pharma for providing Meclizine HCl pure drug, Loba Chemie for providing HPMC samples, and Nirmala College of Pharmacy, Atmakur for encouragement to carry out this research work.

CONFLICT OF INTEREST:

The authors have no conflict of interest regarding this investigation.

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Abbreviations:

MDF- mouth dissolving films; MCZ- Meclizine; HCl- hydrochloric acid; PVP- polyvinyl pyrrolidine; HPMC- hydroxyl propyl methyl cellulose; SLS- sodium lauryl sulphate; PEG-poly ethylene glycol; ODT- oral disintegrating tablets; FT-IR- Fourier transform infrared spectroscopy; DSC- differential scanning calorimetry, SEM- scanning electron microscopy.

REFERENCES:

1. Saurabh R, Malviya R, Sharma PK. Trends in Buccal Film: Formulation Characteristics. Recent Studies and Patents. European Journal of Applied Sciences. 2014 Jan; 3(3):93-101.
2. Averineni RK, Sunderajan SG, Utalik S, Nayak U, Shavi G, Armugam K, *et al.* Development of mucoadhesive buccal films for the treatment of oral sub-mucous fibrosis: a preliminary study. Pharm Dev Technology 2009 Mar; 14(2):199–207.
3. Hitendra Choudary, Pankaj P, Prabat D. Formulation and evaluation of ramipril fast dissolving tablets using solid dispersion. Research Journal of Pharmacy and Technology. 2019 Oct; 12(8): 3764-3772.
4. Nishi Thakur, Mayank Bansal, Neha Sharma. Overview A Novel Approach of Fast Dissolving Films and TheirPatients. Advances in Biological Research. 2013 Aug; 7(2): 50-58.
5. M.D. Nehal Siddiqui, Garima Garg and Pramod Kumar Sharma. A Short Review on A Novel Approach in Oral Fast Dissolving Drug Delivery System and Their Patents. Biological Research. 2011 Nov; 6:291-303.
6. M. Bhattarai, A. Gupta. Fast Dissolving Oral Films: A Novel Trend to Oral Drug Delivery System. Sunsari Technical College Journal. 2016 April; 2(1):58-65.
7. Vishali T, Damodharan N. Orodispersible Tablets: A Review. Research Journal of Pharmacy and Techonology. Sep 2020; 13(5): 2522-2529.
8. Caconica GW, Michael Blaiss. Antihistaminic, anti-inflammatory, a review of the evidence. World allergy organ journal. 2011 Feb; 4(2): 47-53.
9. Leurs R, Church MK Taglialatela M. MH1-antihistamines: inverse agonism, anti-inflammatory actions and cardiac effects. Clinical and experimental allergy. 2002; 32:489- 498.
10. M. Vangala, P. R. Veera Reddy, V. R. Devadasu and S. K. Vemula. Meclizine hydrochloride fast dissolving tablets by sublimation method: Formulation and evaluation, American Journal of Advanced Drug Delivery. 2014 Jan; 2:133–144.
11. KD Tripathi. Essentials of Pharmacology. Jaypee Brothers Medical Publishers, seventh edition, 2013 May; 159-165.
12. Na DH, Faraj J, Capan Y, De Luca PP. Chewing gum of antimicrobial decapeptide (KSL) as a sustained antiplaque agent: preformulation study. J. Controlled Release. 2005 Sep; 107(1): 122-130.
13. N. Sravanthi, Alekhya, Vikram. Formulation evaluation of Mouth dissolving tablets of clozapine by direct compression method. Research Journal of Pharmacy and Techonology. 2017; 10(8): 2543-2550.
14. Yuan Zhao, Peng Quan, Liang Fang. Preparation of an oral thin film containing meclizine hydrochloride: In vitroand in vivo evaluation. Int J Pharm. 2015 Dec 30; 496(2):314-322.
15. Reddy LH and Ghosh BR. Fast dissolving drug delivery systems: A review of literature. Indian Journal Pharmaceutical Sciences. Feb 2002; 64 (4):331-336.
16. Anju sharma, P Sriganesan. Formulation development and optimization of fast dissolving film containing carvedilol nanocrystals for improved bioavailability. JDDT [Internet].2018 Nov; 8(6):74-81.
17. Buchi N Nalluri, Sudhir M. Development of zolmitriptan mouth dissolving films: Formulation variables, mechanical properties, and *in vitro* drug release studies. Asian J Pharm Clin Res 2019; 12:273-279.
18. Muhammad Bilal HM, Tehseen Riaz. Oral Films: A Comprehensive Review. International Current Pharmaceutical Journal. 2016 Nov; 5(12):111-116.
19. Lakshmi P K, Malavika P, Vidya K. Formulation and evaluation of oral films of atomoxetine hydrochloride. International Research Journal of Pharmacy. 2018 Oct; 9(9):105-109.
20. Buchi N. Nalluri, B. Sravani. Development and Evaluation of Mouth Dissolving Films of Sumatriptan Succinate for Better Therapeutic Efficacy. Journal of Applied Pharmaceutical Science. 2013 Aug; 8:161-66.
21. Shubham Biyani, Rajeshwar Kshirsagar. Formulation and evaluation of chlorothalidone loaded mouth dissolving film-a bioavailability enhancement approach using multilevel categoric design. International Journal of Pharmacy and Pharmaceutical Sciences. 2020 Feb; 12(3):34-41.

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TABLES:

Table 1: Formulation of MCZ MDFs

Formulae 5g Size									
Ingredients (mg)	**F1*** **E3 PVP &PEG**	**F1** **E3 PVP &PEG**	**F2** **E5 PVP &PEG**	**F3** **E15 PVP &PEG**	**F4** **E3 SLS &PEG**	**F5** **E5 SLS &PEG**	**F6** **E15 SLS &PEG**	**F7** **E3 PVP &GLY**	**F8** **E5 PVP &GLY**
Meclizine	200	150	150	150	150	150	150	150	150
Methanol	2500	2500	2500	2500	2500	2500	2500	2500	2500
Polymer (HPMC E3, E5, E15)	350	350	350	350	350	350	350	350	350
SLS	------	------	------	------	2	2	2	------	------
PVP	2	2	2	2	------	------	------	2	2
PEG	25	25	25	25	25	25	25	------	------
Glycerol	------	------	------	------	------	------	------	25	25
Water (mg)	1750	1750	1750	1750	1750	1750	1750	1750	1750

Continue Table								
Ingredients (mg)	**F9** **E15 PVP &GLY**	**F10** **E3 SLS &GLY**	**F11** **E5 SLS &GLY**	**F12** **E15 SLS &GLY**	**F13** **E3 PVP &PEG**	**F14** **E3 PVP &GLY**	**F15** **E3 SLS &PEG**	**F16** **E3 SLS &GLY**
Meclizine	150	150	150	150	150	150	150	150
Methanol	2500	2500	2500	2500	2500	2500	2500	2500
Polymer (HPMCE3, E5,E15)	350	350	350	350	350	350	350	350
SLS	------	2	2	2	------	------	4	4
PVP	2	------	------	------	4	4	------	------
PEG	------	------	------	------	25	------		------
Glycerol	25	25	25	25		25	25	25
Water (mg)	1750	1750	1750	1750	1750	1750	1750	1750

Table 2: Evaluation parameters of MCZ MDFs

FORMULATION	**EVALUATION PARAMETERS**						
	Weight Variation±SD	**Thickness (µm)±SD**	**Folding endurance**	**Drug Content (%)**	**Loss of Drying (mg)**	**Disintegration time (Min)**	
						Drop Test	**Petri Plate Test**
F1	11.56±0.49	54.6±3.21	96	58	7.6 to7.0	1min:9sec	6min:36se
F2	9.8±0.3	50.6±0.57	92	56	9.4 to 8.8	1mi: 42se	7min:58se
F3	9.36±0.20	53.6±1.15	119	56	19.6 to19.2	1mi:49sec	8min:15se
F4	6.56±0.56	53±2.64	109	49	6.2 to 5.9	1mi:2sec	6min:15sec
F5	5.83±0.15	56.6±1.52	94	63	6.7 to 6.6	1mi:33sec	8min:49sec
F6	6.93±0.15	58±2.64	30	63	5.5 to	1mi:54sec	8min:10sec

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					5.0		
F7	7.03±0.15	51.6±1.57	75	84	7 to 6.8	1mi:17sec	9min
F8	6.46±0.11	55±3.660	55	65	6.4 to 6.0	1mi:29sec	9min:22sec
F9	7.03±0.15	55.3±4.72	108	59.5	7.2 to 6.9	1mi:36sec	6min
F10	7.16±0.15	55.6±2.88	83	49	7 to 6.9	1mi:10sec	6min:12sec
F11	6.8±0.2	54±1.73	113	35	6.9 to 6.8	1mi:32sec	6min:30sec
F12	7.5±0.1	51.6±0.57	90	50.5	7.4 to 7	2min	6min:40sec
F13	6.36±0.20	55±4.3	58	45	7.4 to 6.9	1mi:29sec	9min:22sec
F14	17.5±0.45	56.6±4.9	97	43	12 to 11.6	1mi:7sec	8min:25sec
F15	12±0.20	55.3±3.78	89	59.5	17.3to 17.3	1mi:35sec	6min
F16	18.6±0.37	55.6±4.93	102	42	18.6to 17.2	2mi:15se	7min:45sec

FIGURES:

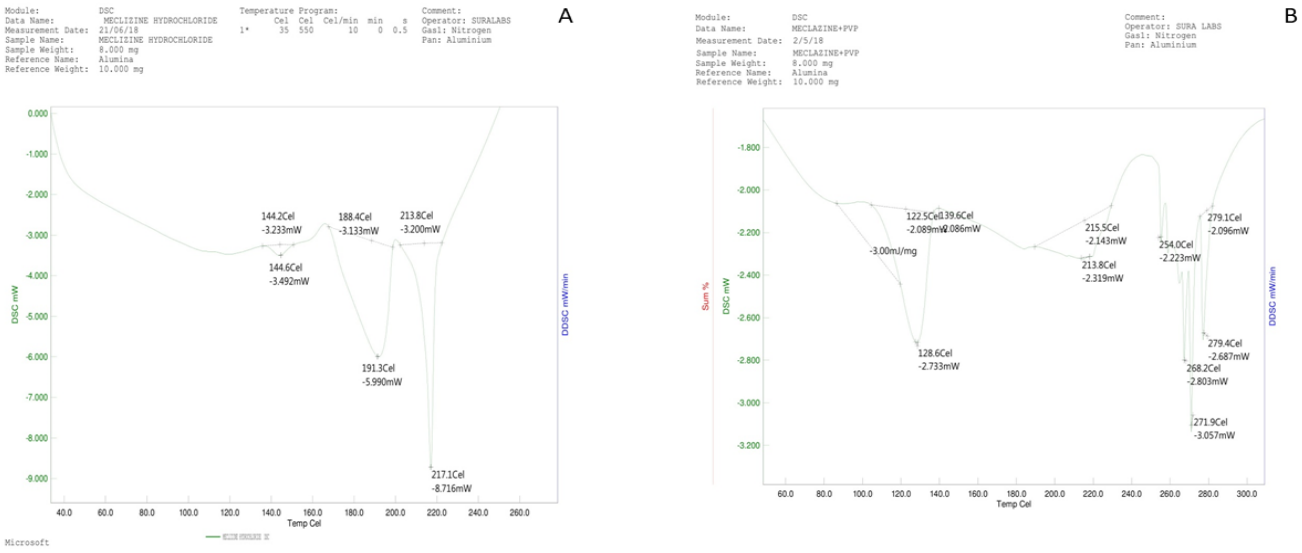

Figure 1: Thermograms of (A) Pure MCZ, (B) MCZ+PVP

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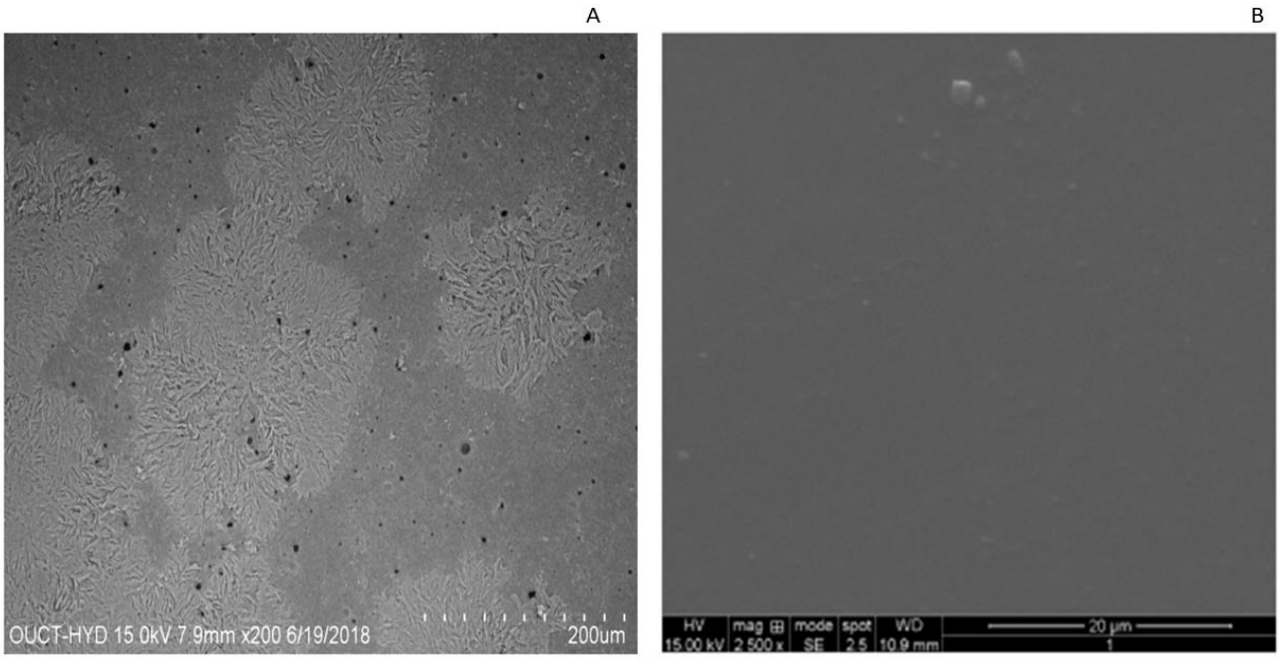

Figure 2: SEM photographs of (A) F1* (B) F13

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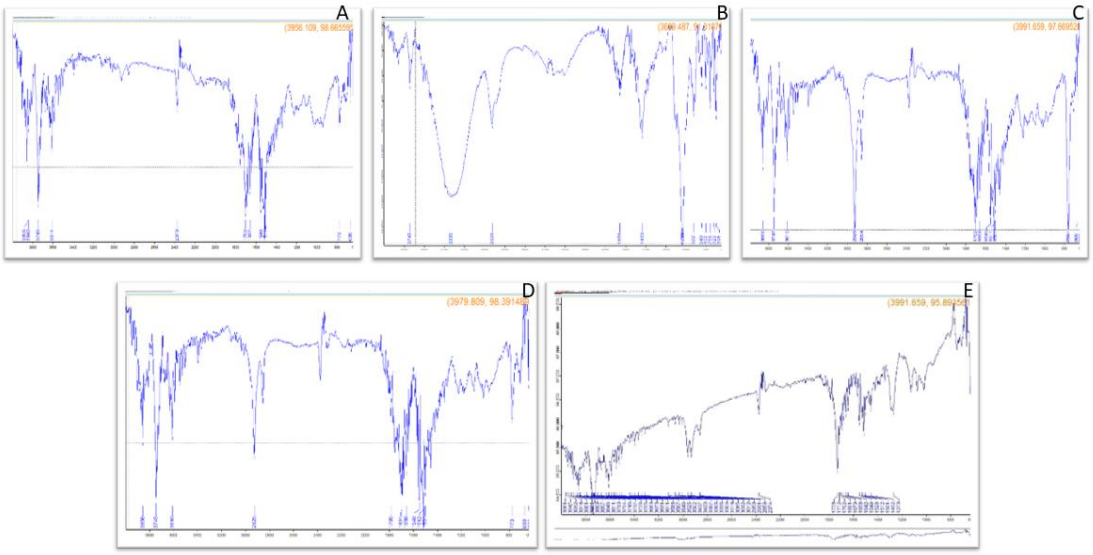

Figure 3: FT-IR spectra of (A) pure MCZ, (B) E3 (SLS, PEG), (C) E3 (SLS, GLY), (D) E3 (PVP, PEG), (E) MDF and E3

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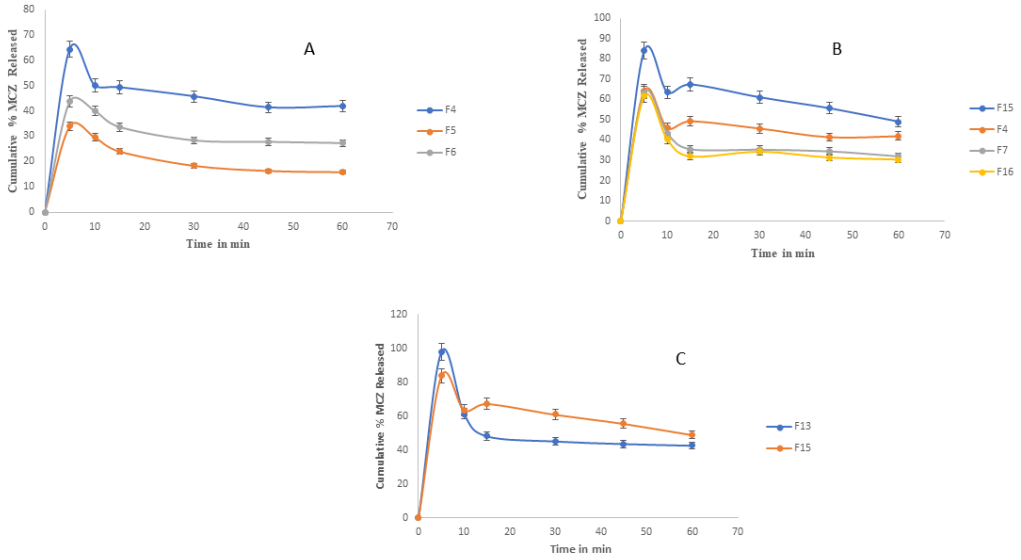

Figure 4: Comparative in vitro drug release profile of MCZ from MDFs (A) Effect of polymer on MCZ release, (B) Effect of Plasticizer, (C) Effect of Surfactant on MCZ release