Research Article
AMERICAN JOURNAL OF PHARMACY AND HEALTH RESEARCH
www.ajphr.com
2015, Volume 3, Issue 6
ISSN: 2321–3647(online)

Comparative Study on Effect of Natural and Synthetic Super disintegrants in the Formulation of Fast Dissolving Palatable Tablets of an Antiemetic Drug

Ankit Acharya[1]*, Ayush Acharya[2], Saroj Paudel[3]
1. Dept of Pharmaceutics, Sri Adichunchanagiri College of Pharmacy, B.G. Nagara-571448 Karnataka, India.
2. Dept of Pharmaceutics, R.R College of Pharmacy, Bengaluru-560 090, Karnataka, India.
3. Dept of Pharmacy practice, Sri Adichunchanagiri College of Pharmacy, B.G. Nagara-571448 Karnataka, India.

ABSTRACT

The main objective of the present work was to formulate fast-dissolving tablets of an antiemetic drug using natural (xanthum gum, Isapgula husk and banana powder) and synthetic (crospovidone and croscarmelose) superdisintegrants by direct compression method and compare their effect on tablet formulations. This study was also aimed to find out the best superdisintegrants for the prepared formulations with better disintegrating property and better *in-vitro* dissolution profile. The infra red spectra of pure drug with different excipients showed no shift in peak, hence no interaction between drugs and excipients. The tablets were subjected to the various parameters like weight variation, hardness, thickness, friability, dispersion time, disintegration time, drug content and *in-vitro* drug release. All the powder blend showed good to acceptable flow ability as the powder blends showed angle of repose below 30°, bulk density in the range between 0.486 to 0.522 g/cm^3, tapped density in the range between 0.568-0.590 g/cm^3, and the compressibility index was found to be between 12.71 and 14.98 which ensures the powder blends may be suitable for direct compression. *In vitro* disintegration time for all formulation batches i.e. F1 to F15 showed wide variation in the range between 23 to 36 seconds. Percentage drug content for all tablets were in between 94.4 to 97.25%. *In vitro* dissolution study for all tablets was performed and formulation F11 containing Isapgula husk as natural superdisintegrants showed 97.25% drug release within 8 minutes, which might be due to swelling ability of Isapgula husk.

Keywords: Domperidone maleate, fast dissolving tablets, super disintegrants, direct compression.

*Corresponding Author Email: ankitbaba99@gmail.com
Received 24 May 2015, Accepted 30 May 2015

Please cite this article as: Acharya A *et al*., Comparative Study on Effect of Natural and Synthetic Superdisintegrants in the Formulation of Fast Dissolving Palatable Tablets of an Antiemetic Drug. American Journal of Pharmacy & Health Research 2015.

INTRODUCTION

Among all drug delivery system, oral route remains the most popular route of drug delivery because oral drug delivery system has the key advantage of convenient administration. The oral medication is generally considered as the first avenue investigated in the discovery and development of new drug entities and pharmaceutical formulations, mainly because of improved patient compliance, acceptance, convenience in administration, and cost-effective manufacturing process. Tablets constitute a major portion of drug delivery systems that are currently available due to its convenience of self-administration, compactness and simple manufacturing process.[1, 2]. In recent years, fast dissolving dosage forms have started gaining popularity and acceptance as new drug delivery systems due to their unique properties. The concept of fast dissolving drug delivery system emerged from need to provide patient with conventional mean of taking their medication. These dosage forms gets quickly disintegrate and dissolve in the mouth and can be administered without water, which makes them particularly suitable patients. [3, 4] . Fast dissolving dosage forms include tablets, films and microspheres. Tablets are the most commonly used amongst them. A tablet is unit solid dosage form in which one usual dose of the drug has been accurately placed by compression. Fast dissolving tablets are also known as porous tablet, melt-in-mouth tablet, oro-dispersible tablet, quick dissolving tablet, orally disintegrating or rapidly disintegrating tablet. USFDA defined fast dissolving tablets (FDT) as "A solid oral dosage form containing active ingredients, which disintegrates rapidly, usually within a matter of seconds, when placed upon the tongue. [5, 6, 7] The target population for these new fast dissolving/disintegrating dosage form are generally paediatric, geriatric and disabled patients. Patients with persistent nausea, who are travelling or who have little or no access to water are also good candidates for fast dissolving tablets. [8]. Vomiting problem is seen in all groups of people and occurs due to stimulation of the chemoreceptor trigger zone (CTZ) situated in the medulla oblongata. The CTZ express a variety of receptors, e.g., histamine H1,dopamine D2, serotonin 5-HT3, cholinergic M and opioid μ through which the emetic signals are relayed and which could be targets of antiemetic drug action[9]. Domperidone is an anti emetic dopamine receptor agonist, that does not penetrate the blood brain barrier but does access the CTZ, to be used to prevent the nausea caused by dopamine agonist. Domperidone is absorbed orally, but bioavailability is less than 15% due to first pass metabolism[9]. The main aim formulating fast dissolving palatable tablets using natural and synthetic super disintegrants was to increase the

water uptake with shortest wetting time and disintegration time of the prepared tablets, which in turn improve dissolution rate and hence its bioavailability.

MATERIALS AND METHOD

Drug and chemical used

Domperidone maleate was obtained as gift sample from Panas Pharmaceutical Pvt. LTD. Nepalgunj, Nepal. Croscarmelose sodium was procured from Yarrow Chem. Products, Mumbai. Crospovidone, Isapgula husk and xanthan gum were procured from Balaji Drugs, India. All other reagents used were of analytical grades.

Determination of melting point

Melting point of pure Domperidone maleate was determined by open capillary method. The average of three values was calculated. [8]

Drug–polymer compatibility studies

In the preparation of tablets formulation, drug and polymer may interact as they are in close contact with each other, which could lead to the instability of drug. Pre formulation studies regarding the drug-polymer interaction are therefore very critical in selecting appropriate polymers. IR spectra of the pure drug and it's physical mixtures were conducted using a Bruker spectrometer and the spectrum was recorded in the region of 4000 to 400 cm^{-1}. All spectra were collected as an average of three scans at a resolution of 2 cm^{-1}. [5]

Formulation development Domperidone maleate fast dissolving palatable tablets (FDT)

Domperidone maleate fast dissolving tablets were prepared by direct compression method using natural and synthetic superdisintegrants. Total fifteen formulations were prepared and the ingredients used in preparation of tablets is mentioned in the **table 1**, keeping the total weight of the tablet constant in all the formulations (200 mg). The drug, diluents, superdisintegrants, sweetener and flavoring agent was added to make FDT palatable and was passed through sieve no 40#. All the above ingredients were properly mixed together (in an air tight plastic container). Magnesium stearate was passed through mesh number 80#, and blended with initial mixture in a plastic container. Finally physical mixtures were compressed into tablets using single punch tablet machine (Lab Press, India) using 8mm flat surface punches under 2-4kg/cm^3 compression force.

Pre-compression evaluation

Before compression, powder mixtures were evaluated for pre-compression parameters such as angle of repose (Θ), bulk density (D_v), true density (D_t), compressibility index (CI), Hausner

ratio (H). From above parameters flow properties and compressibility properties of powder mixtures were determined. Angle of repose was determined by funnel method. Bulk density and Tapped density was determined by bulk density apparatus. Pre-formulation evaluation was done to understand the flow behaviour of powder blends. [2, 3, 10]

Table 1: Formulation chart of Domperidone maleate fast dissolving tablets formulation F1-F15

S.No.	Ingredients (mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15
1.	DomperidoneMaleate	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.	Croscarmelose	5	10	15	-	-	-	-	-	-	-	-	-	-	-	-
3.	Crospovidone	-	-	-	5	10	15	-	-	-	-	-	-	-	-	-
4.	Xanthan Gum	-	-	-	-	-	-	5	10	15	-	-	-	-	-	-
5.	Isapgula Husk	-	-	-	-	-	-	-	-	-	5	10	15	-	-	-
6.	Banana powder	-	-	-	-	-	-	-	-	-	-	-	-	5	10	15
7.	Sodium Saccharin	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
8.	Mannitol	25	20	15	25	20	15	25	20	15	25	20	15	25	20	15
9.	Menthol	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
10.	Magnesium Stearate	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
11.	Flavour	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
12.	MCC	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Total weight of all tablet formulation was 200mg																

Post-compression evaluation

The tablets after punching of every batch were evaluated for in-process and finished product quality control tests i.e. thickness, weight uniformity test, hardness, friability, drug content, *in vitro* dispersion time, water absorption ratio, wetting time and *in vitro* drug release studies. Thickness, hardness and friability were determined by using digital caliper, Monsanto tester and Roche friabilator respectively. Weight uniformity test was done as per I.P method [2, 3, 11]

Drug content estimation

Five tablets were randomly selected and powdered in a glass mortar pestle. The weight equivalent to 10mg Domperidone maleate was weighed and dissolved in a 0.1M HCL solution and the volume was adjusted to 100ml with same and the solution was filtered. From the above solution 1ml solution was taken and diluted to 10ml 0.1M HCL solution in separate volumetric flask. Then the content was determined spectrophotometrically at 286 nm.[12]

***In-vitro* dispersion time**

In vitro dispersion time was measured by dropping a tablet into a petri dish containing 10 ml of phosphate buffer pH 6.8 solutions (simulated saliva fluid). Three tablets from each formulation were randomly selected and tested. *In vitro* dispersion time was found and expressed in seconds. [13]

***In-vitro* disintegration time**

The process of breakdown of a tablet into smaller particles is called as disintegration. The *in-vitro* disintegration time of a tablet was determined using disintegration test apparatus as per I.P. specifications. The tablet was placed in each of the 6 tubes of the basket and added a disc to each tube and the apparatus was run using pH 6.4 (simulated saliva fluid) maintained at 37 ± 0.2 °C as the immersion liquid. The time in seconds taken for complete disintegration of the tablet with no palpable mass remaining in the apparatus was measured and recorded. [13, 14]

***In-vitro* drug release**

In-vitro drug release studies was carried out using USP-type II dissolution apparatus (paddle type). The dissolution medium, 900 ml of 0.1M HCL solution, was placed into the dissolution flask maintaining the temperature of 37±0.5ºC and of 50RPM. One tablet was placed in each flask of dissolution apparatus. The apparatus was allowed to run for 10 min. Samples measuring 1 ml were withdrawn after every 2, 4, 6, 8, and 10 min. Samples were filtered. The fresh dissolution medium was replaced every time to maintain sink condition. The collected samples were analyzed at 286 nm using dissolution medium as blank. The cumulative percentage drug release was calculated. [13]

Kinetics of drug release

To study the release kinetics of *in-vitro* drug release, data obtained from *in-vitro* release study were plotted in various kinetic models: zero order as percent drug release Vs time, First order as log percent drug retained Vs time, Higuchi as percentage drug release Vs square root of time, Korsmeyer-Peppas as log % drug release Vs log time. [14]

Stability studies

Optimized formulations were stored at;40° C ±2°C /75% RH ± 5% RH in thermo lab humidity chamber for 3 months. The optimized formulation stored in the sealed aluminum foil. The optimized formulation was analyzed for 3 months for friability, hardness, dispersion time and *in-vitro* drug release. [14]

RESULTS AND DISCUSSION

Determination of melting point

The melting point of Domperidone Maleate was found to be 237ºC, which was similar with the reported value and result indicated the sample was pure.

Drug–polymer compatibility studies

The IR spectrum of the pure Domperidone Maleate, mixture of drug and Isapgula husk, physical mixture of drug and all excipients, showed that the characteristic peaks of the drug are present in the mixture and in the standard frequency range, depleting interaction between drug and other excipients, thus determining integrity of the sample. The IR spectra of Domperidone maleate and its physical mixture with excipients were shown in table 2 and figure 1, 2, 3.

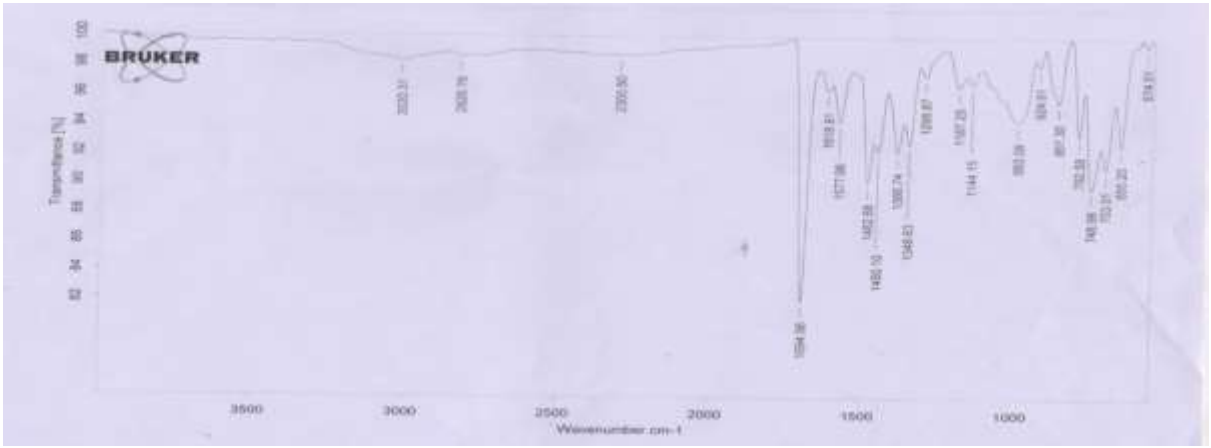

Figure 1: FTIR Spectra of pure Domperidone maleate drug

Figure 2: FT-IR spectra of Domperidone maleate and Isapgula Husk

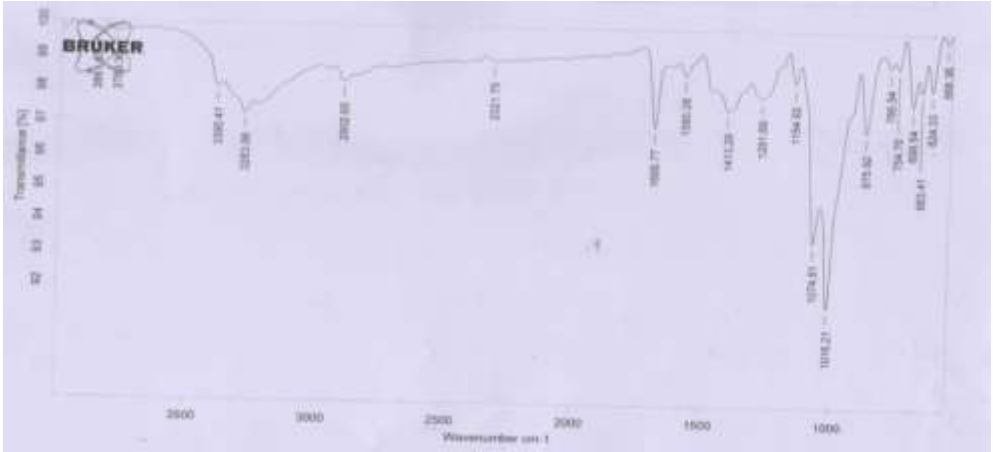

Figure 3: FTIR spectra of drug and other excipients

Table 2: FT-IR Spectral data of pure drug and the drug with other excipients

Description	Domperidone maleate (cm^{-1})	Domperidone maleate and Isapgula husk (cm^{-1})	Domperidone maleate and excipients (cm^{-1})	Standard frequency range (cm^{-1})
=C-H stretching	3020.31	3271.23	3283.98	3010-3100
C-H stretching	2826.76	2852.24	2902.69	2800-3000
C=O stretching	1644.96	1642.31	1695.77	1670-1820
C=C stretching	1618.41	1422.08	1580.28	1615-1680

Results of pre-compression parameters

In this present study, pre-formulation studies were performed for all formulations and results obtained are dissipated in table 3. Angle of repose of all the formulations was found to be ranging from 24.01±1.00 to 29.44±0.90, indicating powder blends exhibited good flow properties. Bulk density was found to be 0.486±0.005 to 0.522±0.044 gm/cc, tapped density was in between 0.568±0.017 to 0.590±0.003 g/cc, Carr's index was found to be within 12.43±0.063 to 14.98±0.005 and Hauser's ratio was found to be within 1.14±0.013 to 1.17±0.011 indicating good compressibility property of powder blends.

Post-compression evaluations

The various standards or quality control tests carried out on compressed tablets and results are dissipated in table 4.

Shape and colour of tablets

The size and shape of the tablet can also affect the dispersion time and subsequent dissolution profile. In general a smaller tablet, in terms of mass, has a faster dispersion time than a larger tablet, all other factors being equal. Similarly, a tablet shape with more surface area generally has a faster dispersion time than a tablet shape having less surface area, all other factors being equal. In the present study the maximum dispersion time of the tablet was observed to be 46.33±2.1 seconds, which is practically expected. This revealed that the tablets even possess a higher mass because of the shape (larger surface area) and use of super disintegrants the dispersion time was not affected. Formulated tablet were circular and white in colour.

Table 3: Results of pre-compression evaluations

Formulation code	Bulk Density (gm/cm^3)	Tapped Density (gm/cm^3)	Carr's Index (%)	Hausner's Ratio	Angle of Repose (°)
F1	0.489±0.003	0.575±0.001	14.67±0.001	1.17±0.005	26.84±1.00
F2	0.522±0.044	0.587±0.003	14.11±0.016	1.16±0.001	26.57±1.10
F3	0.501±0.009	0.570±0.014	12.96±0.004	1.14±0.013	24.87±1.45
F4	0.522±0.044	0.577±0.009	14.96±0.081	1.17±0.001	26.67±1.12
F5	0.502±0.008	0.579±0.012	13.79±0.005	1.16±0.041	29.44±0.90

F6	0.487±0.009	0.573±0.003	14.71±0.008	1.17±0.002	26.85±0.02
F7	0.506±0.044	0.586±0.044	14.20±0.013	1.16±0.001	27.14±0.04
F8	0.502±0.001	0.583±0.009	12.71±0.001	1.16±0.008	28.83±1.05
F9	0.502±0.061	0.590±0.003	14.96±0.001	1.16±0.003	28.12±0.23
F10	0.497±0.001	0.574±0.012	12.43±0.063	1.14±0.014	27.75±0.91
F11	0.494±0.004	0.583±0.011	14.97±0.004	1.17±0.011	28.12±0.12
F12	0.493±0.008	0.576±0.005	13.82±0.001	1.16±0.007	27.78±1.20
F13	0.486±0.005	0.568±0.017	14.58±0.041	1.15±0.003	24.23±0.12
F14	0.494±0.001	0.570±0.001	14.58±0.002	1.17±0.011	24.85±0.11
F15	0.506±0.009	0.588±0.003	14.98±0.005	1.17±0.009	24.01±1.00

- **All are mean of three readings ± SD**

Table 4: Results of post-compression evaluation

Formulation code	Thickness (mm) (n=3)	Hardness (kg/cm^2) (n=3)	Friability (%) (n=10)	Weight variation (mg) (n=10)	Drug content (%) (n=5)	Dispersion time (sec) (n=3)	Disintegration time (sec) (n=3)
F1	3.6±0.1	3.4±0.3	0.73±0.02	203.6±1.07	94.4±0.3	38.6±2.3	26±1.8
F2	3.5±0.1	3.3±0.1	0.78±0.03	203.5±1.13	95.5±0.7	37.3±2.7	27±1.1
F3	3.6±0.2	3.0±0.1	0.98±0.01	203.6±0.98	95.8±0.2	40.3±1.8	23±1.2
F4	3.3±0.2	3.0±0.4	0.70±0.01	201.4±1.11	96.2±0.8	39.0±0.0	26±2.1
F5	3.2±0.6	3.1±0.2	0.60±0.08	201.2±0.99	94.8±0.5	40.0±1.1	27±2.8
F6	3.4±0.1	2.9±0.3	0.84±0.03	201.8±1.10	94.1±0.5	38.3±0.9	23±1.4
F7	3.8±0.1	3.5±0.5	0.98±0.01	203.6±1.07	95.3±0.7	38.0±1.0	32±2.2
F8	3.6±0.2	3.5±0.6	0.68±0.04	203.4±1.01	95.5±0.1	36.3±0.9	29±1.5
F9	3.6±0.2	2.8±0.1	0.79±0.03	201.8±0.81	94.8±0.6	36.3±1.0	27±0.9
F10	3.5±0.1	2.8±0.2	0.68±0.08	201.4±1.12	95.6±0.7	32.0±1.0	24±1.2
F11	3.4±0.2	2.9±0.2	0.74±0.04	201.6±0.79	97.8±0.2	32.3±1.1	23±1.3
F12	3.4±0.2	3.2±0.3	0.68±0.07	201.4±1.10	96.1±0.3	30.0±1.0	21±1.1
F13	3.8±0.1	3.1±0.4	0.63±0.01	203.7±1.12	95.2±0.4	46.0±1.0	31±2.4
F14	3.6±0.1	2.7±0.4	0.45±0.09	199.4±0.99	94.8±0.8	46.3±2.1	36±0.9
F15	3.6±0.6	3.0±0.1	0.478±0.2	199.8±0.10	94.3±0.9	43.3±1.6	32±1.7

Thickness

Thickness for all formulation batches was found to be between 3.2±0.6 to 3.8±0.1 mm**.** This finding was observed again due to constant tablet press setting across all batches, irrespective of weight variation.

Hardness

Tablet crushing strength, the critical parameter was controlled as the resistance of tablets to capping, abrasion or breakage under conditions of storage, transportation and handling before usage, depends on its hardness. Hence, hardness for all formulation batches i.e. F1 to F15 was found to be between 2.7±0.4and 3.5±0.6 Kg/cm^2. This finding was observed due to constant tablet press setting across all batches, irrespective of weight variation.

Friability

Friability is needed for tablets to withstand force of compression applied during the manufacture of tablets. The friability of all the formulated tablets of Domperidone maleate was found to be in the range of 0.45±0.09-0.98±0.01%. All the formulated tablets of Domperidone maleate showed the % friability within the official limits, i.e. not more than 1%.

Weight Variation

As material was free-flowing, tablets were obtained of uniform weight due to uniform die fill with acceptable variation as per I.P. standards. The weight of the tablets was in between 199.4±0.99 mg to 203.7±1.12 mg. Hence, weight variation test for all batches of tablets comply I.P. specifications.

Drug content

The drug content of all the fifteen formulations of Domperidone maleate tablets was found to be within the range of 94.4±0.3% to 97.8±0.2% and obtained results were as BP specifications.

***In vitro* dispersion time**

All the formulated tablets F1-F15 have shown *in vitro* dispersion time of less than 60 sec, showing that formulated Domperidone maleate tablets were better and effective for the treatment of vomiting than conventional tablets. Among all the formulations, tablets prepared with Isapgula Husk showed less than 33 sec. of dispersion time.

***In-vitro* disintegration time**

Disintegration is the first important step in the drug absorption and it is an important parameter for fast dissolving tablets. Among all the formulation, Formulation F12 containing higher concentration of Isapgula husk showed less disintegration time i.e. 21 sec, when compared to other formulations. From the obtained results, it was also observed that the disintegration time of all formulation was decreased with increase in concentration of superdisintegrants. These results were correlated with *in-vitro* drug release results.

***In vitro* dissolution study**

After getting all the physical parameters satisfactory, the dissolution for all the batches was tested. Among all the formulation, formulation F11 containing higher concentration of Isapgula husk showed 97.25% of drug the release within 8 min. The higher percentage of drug released by this formulation may be due to combined effect; swelling effect of Isapgula husk along with amorphization of tablets by mannitol. The percentage drug released was obtained in the following order, F11> F5> F10> F3> F6> F8> F12> F2> F1> F7> F9> F13 >F4> F14> F15. *In-vitro* disintegration results were co-related with drug release studies, results showed that

formulation which exhibited shorter disintegration time showed highest percentage of drug release at the end of 8 min. Results of *in-vitro* drug release (figure 4 and 5) also reviled that, as the concentration of super disintegrates increases cumulative percent of drug release was also significantly increases. Formulation F1-F6 containing synthetic super disintegrates showed less drug release when compared to formulation containing natural super disintegrates i.e. formulation F7-F15, this might be due to swelling effect of natural super disintegrates. Based up on the results of *in-vitro* drug release results formulation F11 was considered as optimized formulation and this formulation was subjected to further studies.

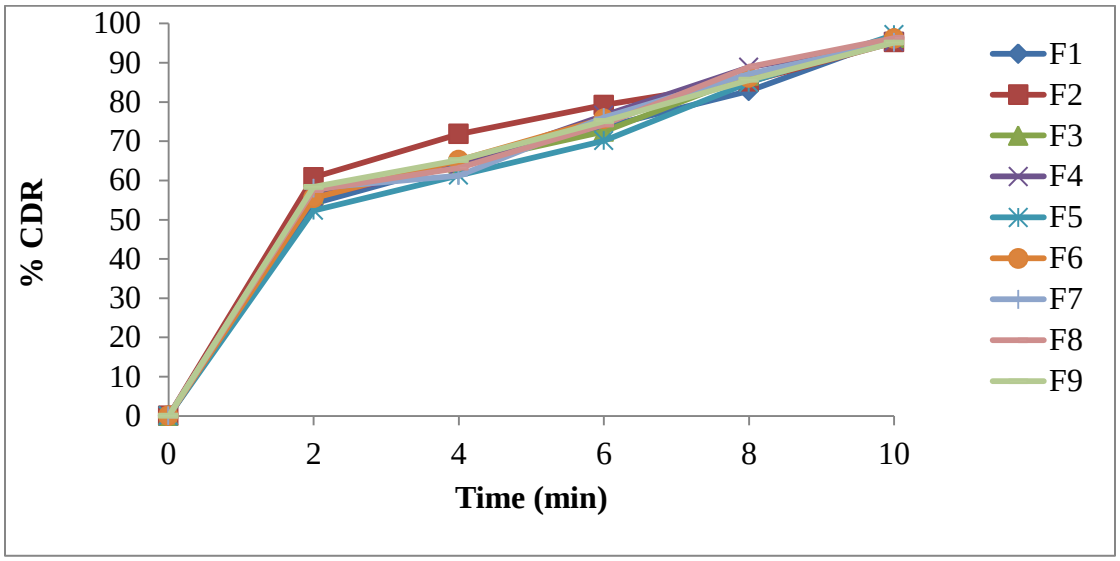

Figure 4: *In-vitro* drug release profile of formulation F1 to F9

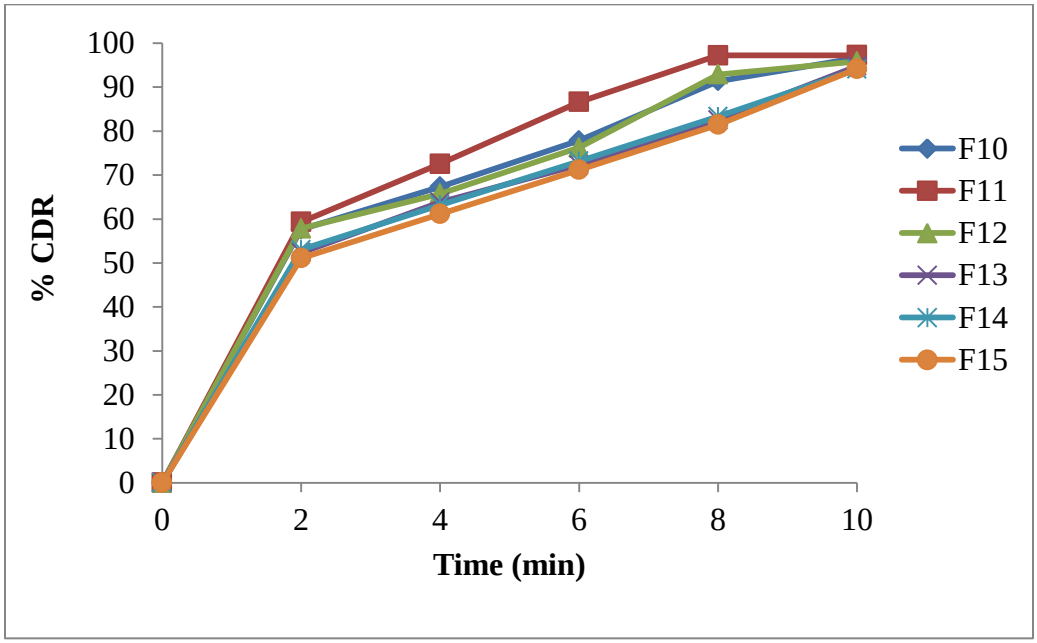

Figure 5: *In-vitro* drug release profile of formulation F10 to F15

Drug release kinetic studies

The results of dissolution data of formulation F11 was fitted to various kinetic models to analyze the drug release mechanism. The selected formulation F11 followed Higuchi matrix model, as the values of this model was closer to 1. Korsmeyer-Peppas model showed "n" value of 1.70, which indicates that the drug release follow super case II transport. The kinetics values for selected formulation are given in table 6.

Stability Studies

Stability studies for the promising formulation F11 was carried out by storing at 40° C ±2°C /75% ± 5% RH for the period of three months. For every one month interval the tablets were analyzed for the colour, friability, hardness, disintegration time and *in–vitro* drug release. The increase in the disintegration time was observed in the tablets after 3 months of study. This may be due to increase in hardness of tablets after storage of 3 months. However there is no significance change in all the parameters. Results were shown in **table 6**.

Table 5: Curve fitting data of the release rate profile for selected formulation F11

Formulation	Best fit model (r^2)	Zero order (r^2)	First order (r^2)	Higuchi matrix (r^2)	Korsmeyer-Peppas (r^2)	(n)
F11	Higuchi	0.795	0.673	0.971	0.673	1.70

Table 6: Stability studies of formulation F11 at 40°C ±2°C /75% ± 5% RH

Months	Colour	Friability	Hardness	Disintegration time	%CDR
1	white	0.74±0.04	2.9±0.2	25±0.2	97.27±0.3
2	white	0.74±0.04	2.9±0.2	26±0.3	96.95±0.1
3	white	0.76±0.2	3.0±0.1	27±0.1	96.15±0.1

CONCLUSION

Fast dissolving tablets of Domperidone maleate could be considered as safe and useful oral delivery system to increase the drug bioavailability and to improve patient compliance. From this study, it can be concluded that natural super disintegrants could be applied effectively in preparation of FDTs with better water absorption, disintegration and drug released properties. The prepared FDTs disintegrate within a minute; thereby enhance the absorption leading to increased bioavailability of Domperidone maleate, hence gives quick relief from emesis.

ACKNOWLEDGEMENTS

The authors are thankful to Principal R.R College of Pharmacy, Bangalore for providing all necessary facilities and moral support to carry out this research work.

REFERENCES

1. Mahesh E, Kiran Kumar GB, Mohammed GA, Kumar KP. Formulation and evaluation of Montelukast sodium orodispersible tablets. Asian J Biomed Pharma Sci 2012; 2(14): 75-82.
2. Shah R, Shah D, Patel CA,Keraliya RA. A comprehensive review on fast disintegrating tablets and its manufacturing techniques. Int J Mod Pharm Res 2013; 2(2):24-65.
3. Elkhodairy KA, Hassan MA, Afifi SA. Formulation and optimization of orodispersible tablets of Flutamide. Saudi Pharma J 2014; 22: 53-61.
4. Habib W, Khankari RK, Hontz J. Fast-dissolve drug delivery systems. Crit Rev Ther Drug Carrier Sys 2000; 17:61-72.
5. Maren P, Miriam P, Breitkreutz J. Development of a taste-masked orodispersible film containing Dimenhydrinate. Pharmaceutics 2012; 4:551-62.
6. Naikwade JT, Patil VV, Katkade MH, Thorat VD, Ansari T, Vaidya CR. Formulation and evaluation of orodispersible tablets of Amlodipine Besylate by using co-processed superdisintegrants. Brit J Pharma Res 2013;3(4):865-79.
7. Nagendrakumar D, Raju SA, Shirsand SB. Design of orodispersible Granisetron HCl tablets using novel co-processed superdisintegrants. Bio Sci Tech 2009;1(1):8-14.
8. Rane DR, Gulve HN, Patil Vasant VV, Thakare VM, Patil VR. Formulation and evaluation of orodispersible tablet of Albendazole. Int Cur Pharma J 2012; 1(10):311-16.
9. Tripathi KD. Essentials of medical pharmacology. 6th ed., New Delhi: Jaypee Brothers Medical Publishers Pvt. Ltd; 2006: 639-41.
10. Sukhavasi S, Kishore VS. Formulation and evaluation of orodispersible tablets of Amlodipine besylate by using Fenugreek seed mucilage and Ocimum basilicum gum. Int Cur Pharma J 2012; 1(9): 243-49.
11. Patil SC, Payghan SA, Disouza JI. Formulation and evaluation of oral disintegrating tablet of Lornoxicam. Int J Pharma Bio Arc 2011; 2(5): 1518-23.
12. Gaur K, Tyagi LK, Kori ML, Sharma CS, Nema RK. Formulation and characterization of fast disintegrating tablets of Aceclofenac by using sublimation method. Int J Pharm Sci Drug Res 2011; 3(1): 19-22.
13. Elbary AA, Ali AA, Aboud HM. Enhanced dissolution of Meloxicam from orodispersible tablets prepared by different methods. Bulletin of Faculty of Pharmacy, Cairo University 2012; 50: 89-97.

14. Basak SC, Selvin CDS, Sabapathy R. Formulation and *in-vitro* evaluation of Amoxicillin dispersible tablets. The Indian Pharmacist 2006; 5(49): 71-03.