WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 3, 1005-1024. Research Article ISSN 2277– 7105

FORMULATION AND EVALUATION OF ORO DISPERSIBLE TABLETS BASED ON ONDANSETRON HYDROXY PROPYL-B-CYCLODEXTRIN COMPLEXES

Nadir Khan*[1], Nitya Shanty[1], Alok Kumar[1], Robinsh Kumar[1] and Vidhan Chand Bala[2]

*[1]Department of Pharmaceutics L.B.S.S Degree College, Gohawar, Noorpur, Bijnor, Uttar Pradesh, 246734, India.

[2]Department of Pharmacology Oxford College of Pharmacy Industrial Area, UPSIDC, Masoorie Gulawati Road, Hapur, Uttar Pradesh, India.

Article Received on
29 Dec. 2019,

Revised on 19 Jan. 2020,
Accepted on 09 Feb. 2020,

DOI: 10.20959/wjpr20203-16873

***Corresponding Author**
Nadir Khan
Department of Pharmaceutics L.B.S.S Degree College, Gohawar, Noorpur, Bijnor, Uttar Pradesh, 246734, India.

ABSTRACT

Orodispersible tablets (ODTs) containing Ondansetron (OND) Hydroxy Propyl –β- Cyclodextrin (HP-β - CD) were prepared by direct compression. The solubility of OND was enhanced by complexation with HP-β – CD by kneading method. The complex 1:1 molar ratio exhibited highest solubility was compressed into ODT. Crospovidone was used as a Superdisintegrant in the range of 2.5 to 10% w/w. The disintegration time of tablets of various batches was in the range of 60 to 80 seconds. The in vitro release study displayed faster and complete release of drug within 30 minutes. The prepared batches were compared with marketed orally disintegrating tablets. In the present study, ODT of Ondansetron containing HP-β- CD were prepared by direct compression using Superdisintegrant Crospovidone. 1:1 molar ratio was chosen and the complex was prepared by kneading method. The solubility of drug was found to be 0.018±0.005mg/ml and by complexing with HP-β-CD the solubility was increased up to 2.82±0.54mg/ml. Angle of repose, bulk density, tapped density; Carr's index and hausner ratio all were in range according to the pharmacopoeia. Disintegration time was under the limit. The In vitro release was faster as compare to the marketed formulation.

KEYWORDS: Orodispersible tablets, Ondansetron, Hydroxy propyl - β- Cyclodextrin, inclusion complex, Superdisintegrant, solubility analysis.

INTRODUCTION

Orodispersible tablets (ODTs) are the solid unit dosage forms, which rapidly dissolves in the mouth without the help of water and no need to be chewed. They release their drug content immediately. It is an innovative technology which leads to release its content in just a few seconds and providing the optimal convenience to the patient.[1] ODT technology is convenient, particularly, for dosing the pediatrics, geriatrics and psychiatric patients, which get problem in swallowing them. They have been found for their potential, improving of bioavailability for poorly soluble drug by enhancing its dissolution profile of the drugs and metabolism of the drugs too. Their demands have been rapidly increasing because it has got a significant impact on the patient compliance. It has become one of the fastest and the leading segments of oral drug delivery for the pharmaceutical industry and the product pipeline is continuously expanding.[2-4]

Its terminology has been approved by various authoring bodies like as the United States of Pharmacopoeia, British pharmacopoeia, Centre for Drug Evaluation & Research (CDER). They dissolve in the mouth because they are made up of either very porous & soft molded matrices or they are compacted into tablets with the low concentration process, which helps to make the tablet friable or brittle.[5] As there is rapid market growth of ODT products, there is also an advancement in its technologies over the year. The newest or latest generation of ODTs is able to produce more rebuts, unique tablets that overcome the limitation of earlier ODTs. They have been recently emerged as a unique drug delivery system and helps in solving many more problems that has been faced by the pediatrics and geriatrics patients.[6,7]

The ODT due to its recently developed drug delivery system, it has got excellent approach to extend potency, due to this it has also increased its marketing. In recent decades or years, the various pharmaceutical researches are carrying out for developing the new dosage forms. And also looking for that it should maintain the quality of life and also focuses on the ease of medications. Thereafter, several dosage forms have been developed or designed to facilitate the ease of medications and for that the ODT has been mostly employed for the commercial products.[4, 8-10]

There is a very much important role of water in swallowing the oral dosage forms but sometimes people experience it as inconvenient. These problems can be solved by means of ODT, when water is not available during the travelling or journey, and also in case of motion sickness and also during several other conditions like as common cold, allergic

Conditions[3,11-13] The major advantage of ODT formulations is that it combines with liquid as well as congenital tablet formulations. The scientists have formulated or developed various categories of ODTs formulations that are used for the therapy in which there is required for rapid peak plasma concentration and also to achieve the desired pharmacological response.[4,14]

The basic approach for the development of ODT was the water uptakes which usually cause the explosions of tablet matrix. ODT with good taste and better flavors increases the it demands of various age groups of populations. The development of these tablets is giving us an opportunity for line extension in the market place to stand.[15] The ODT can be formulated by different technology as freeze drying, tablet molding, direct compression, spray drying, sublimation, its methods have been found by the researchers to maximize the pore structure of the matrix tablets.[3,16-20] These tablets are also known by different names such as mouth dissolving tablets (MDT), fast melting, fast dispersing and quick disintegrating.[4,21-23]

MATERIALS AND METHODS

Materials

The different chemical and instrument used in this article are:

Table 1: List of material required.

S.NO	Materials	Suppliers
1	Ondansetron	Yarrow Chem.
2	HP-β-CD	Yarrow Chem.
3	Crospovidone	Yarrow Chem.
4	MCC	Yarrow Chem.
5	Mannitol	029148 (CDH)
7	Polyvinyl pyrrolidone	Yarrow Chem.
8	Magnesium stearate	RM7219 (HIMEDIA)

Table 2: Lists of research equipments.

Instrument/Equipment	Model number	Manufacturer/supplier
Double beam UV spectrophotometer	2101	Systronics; Ahmadabad, India
Dissolution apparatus	TDT-08L	Electro Lab, India
Disintegration apparatus	ED;2AL	Electro Lab, India
Digital melting point apparatus	1013A	Perfit, India
Digital balance	ATX224	Shimadzu corporation
Digital pH meter	Mks V1	Systronics; Ahmadabad, India
Hardness tester	EH-01p	Electro lab, India
Friability apparatus	EF:2	Electro lab, India
FTIR	BX2	Perkin Elmer; Norwalk, USA
Tablet punching machine	OSD 62	Cadmic; Delhi, India

Method

Identification of drug

Determination of Melting point

The OND was filled in one end fused capillary tube and kept into digital melting point apparatus. The apparatus was operated and the temperature at which drug start melting was noted as melting point.

Determination of λ_{max}

The OND solution was scanned over the range of 300-400nm using UV spectrophotometer.

FTIR spectroscopy

The FTIR spectroscopy of drug OND was carried out. It was confirmed that it can be further used for any analytical purpose.

Pre-formulation studies

Preparation of standard plot

Accurately weighed amount of Ondansetron was dissolved in fixed amount of solvent and volume was adjusted to make the stock solution of 100ppm. Proper dilutions was prepared and observed by UV spectroscopy then absorbance was plotted against concentration to get standard plot and equation of straight line was estimated.

Solubility analysis of drug

Ondansetron in excess amount was added in water as well as in 0.1NHCl. These flasks were subjected to shaking for 12 hours at room temperature. Then the resultant suspension was filtered and analyzed by UV-Visible spectrophotometer after proper dilutions, if necessary.

Formulation of various batches by complexation method

Selection of complexation method formulation

Kneading method

OND with HP-β- CD were mixed in mortar pestle. Small quantity of ethanol was used to prepare slurry. Then the prepared slurry was dried at 25 C for 24hrs. Thereafter the resultant was pulverized and passed through sieve no. 80 and stored in desiccators over fused calcium chloride.[24,25]

Preparation of ODT

Direct compression technique

Tablets are prepared directly without any prior treatment by directly compressing drug and excipient.

Evaluation of powder[26,27]

Angle of repose

The powder was poured through funnel placed at a fixed height and allowed to form a heap. The cone height (h) was noted. Heap radius (r) was measured and angle of repose was calculated by using formula: $\theta = \tan^{-1}\frac{h}{r}$ Where, θ = Angle of repose, **h**= Height of heap, **r**= Radius of heap.

Bulk density

The blend was poured into a graduated cylinder. Bulk volume and weight was determined. The bulk density was calculated using the formula: $\rho^b = \frac{M}{V_b}$ Where, **M**= Bulk weight of blend, V_b= Bulk volume of the blend.

Tapped density

The measuring cylinder having known mass of blend was tapped for a fixed time. The minimum volume (v) occupied in the cylinder and the weight (M) of the blend was measured. Tapped density (t) was calculated using the formula: $\rho^t = \frac{M}{V_t}$ Where, **M** = Weight of the blend, V_t = Tapped volume.

Carr's compressibility Index

Compressibility is an indication of the ease with which a material can be induced to flow is given by % compressibility which is calculated as: $\text{Carr's index}\ (\%) = \frac{(D_t - D_b)}{D_t} \times 100$

Where D_t= tapped density of the powder, D_b =Bulk density of the powder.

Hausner's ratio

It is an index of ease of powder flow. It was calculated by the following formula: $\text{Hausner's Ratio} = \frac{\rho^b}{\rho^t}$ Where, ρ^b = bulk density of powder, ρ^t = tapped density of the powder.

The powders after evaluation was compressed into tablets by employing rotary punching machine using 8mm diameter punch.

Evaluation of ODT based on HP-β- CD complexes

In vitro Disintegration test

Tablets were evaluated for disintegration time using disintegration apparatus USP. 6 tablets were kept in apparatus for test at 25±1 0c temperature in pH 6.8 phosphate buffer as media. The tablets were examined for any UN dissolved fragment of tablet.[28,29]

Friability test

In these 10 tablets was weighed and allowed rotating at 25 RPM for 4min in Rouchefriabilator. The fines were removed and tablets were weighed. The percentage weight loss was calculated as fria % bility.[30,31]

Hardness test

Hardness of tablet was measured in Newton by using Digital hardness tester.

Weight variation test

20 tablets we reweighed and average weight of tablets was calculated, then individual tablet was weighed and compared with average weight calculated.[30,31]

In vitro drug release study

Dissolution was performed using USP dissolution apparatus Type II (paddle type) maintained at 37±0.5 ^{0}C and 50 rpm, by using 0.1N HC1 as dissolution media.[28,29]

RESULTS AND DISCUSSION

Identification of drug

Melting point

Melting point analysis carried out to identify the obtained drug. Melting point is characteristics of any compound. It was found to be 185^{0}C. The melting point matches the value given in literature, so it was anticipated that drug was pure and suitable for use.[32]

UV Spectroscopy Method

OND was scanned in the range of 200-400 nm using a UV visible spectrophotometer to determine λ_{max} of the given drug. The λ_{max} of the drug was found to be 310 nm which was

comparable with the reported λ_{max}.[33] The λ_{max} thus obtained was further used in drug analysis.

FTIR spectroscopy

The FTIR analysis of any compound is to be done to determine the functional groups present. The OND was identified further by FTIR spectroscopy. The FTIR spectrum of OND is depicted in fig.

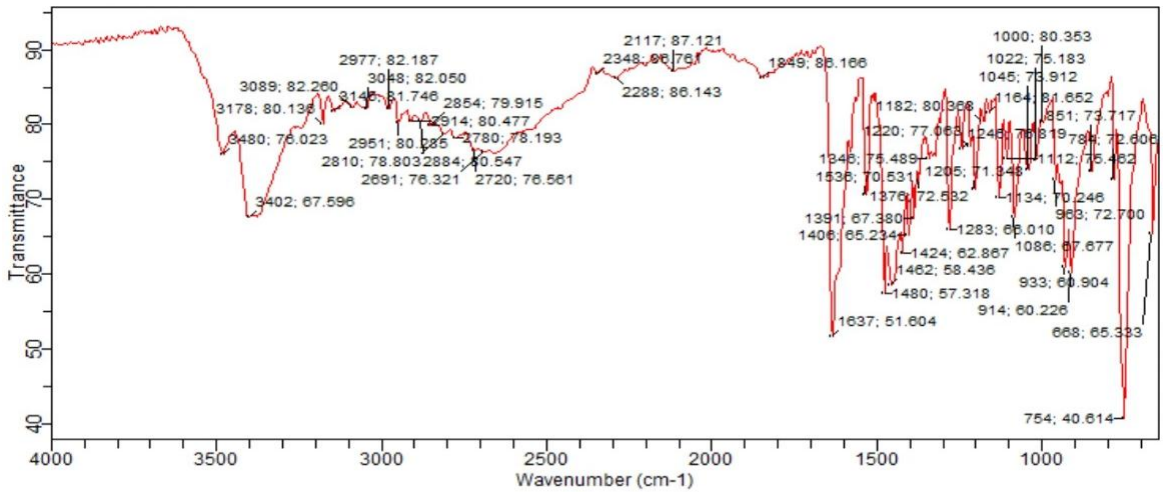

Fig 1: FTIR Spectrum of Ondansetron.

The results of FTIR spectroscopy are shown in table

Table 3: FTIR Interpretation of Ondansetron.

Functional group	Type of vibration	Observed number cm^{-1}
O-H	Stretching	3479
N-H	Stretching	3406
C-H	Stretching	2920
C=O	Stretching	1637
N-H	Bending	1531
Aliphatic C-H	Stretching	1455
C=N	Bending	1637

The characteristics FTIR peaks of OND were 3479, 3406, 2920, 1637, 1531, 1455, 1637cm^{-} corresponding to O-H stretching, N-H stretching, C-H stretching, C=O stretching, N-H Bending, aliphatic C-H stretching and C=N bending respectively. The observed peaks were found superimposed with the reference FTIR spectrum (IP, 2010). This signified that the obtained drug is OND.

From the Melting point analysis, UV spectroscopy & FTIR it was found that the model drug used was OND.

Analytical method of OND

Scanning of OND in distilled water

Scanning of drug in distilled water was carried in UV- visible spectrophotometer and was found to be at 309 nm which is close to the reported λ_{max} i.e. 310 nm.[IP,2010]. This can be employed for constructing standard plot of Ondansetron in distilled water.

Preparation of Standard plot in distilled water

The standard curve of Ondansetron in distilled water is shown as follows in fig 5.4. The calibration curve showed the slope of 0.004 and correlation coefficient of 0.993. The plot was found to be linear in the concentration range of 2-20µg/ml at 310nm and hence, followed Beer's Law in this range. The plot was used in obtaining concentration of drug in further analysis.

Table 4: Absorbance of standard solution of Ondansetron in distilled water.

Concentration(µg/ml)	Absorbance ± S.D
2	0.118±0.004
4	0.145±0.002
6	0.289±0.02
8	0.351±0.004
10	0.429±0.008
12	0.574±0.008
14	0.632±0.017
16	0.756±0.007
18	0.820±0.010
20	0.916±0.007

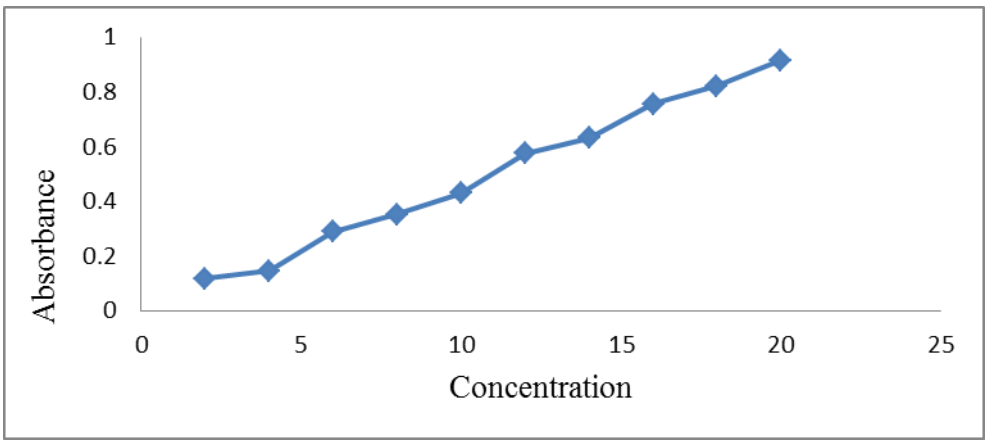

Fig. 2: Standard Plot of Ondansetron in distilled water.

Preparation of standard plot in 0.1N HCl

The standard curve of OND in 0.1N HCl was obtained is shown in fig. 5.5: Table 5.3. The calibration curve shows the slope of 0.004 and coefficient of correlation 0.993. The graph of absorbance versus concentration for OND was found to be linear in the concentration of 4-20µg/ml at 310 nm & followed Beer's law in range. This was employed for determining concentration of the drug during solubility studies.

Table 5: Absorbance of standard solution of Ondansetron in 0.1 N HCl.

Concentration (µg/ml)	A_1	A_2	A_3	Mean	S.D.
4	0.191	0.187	0.188	0.188	0.001
8	0.394	0.396	0.394	0.394	0.009
12	0.581	0.584	0.587	0.584	0.002
16	0.781	0.780	0.785	0.782	0.002
20	0.996	0.996	0.991	0.994	0.002

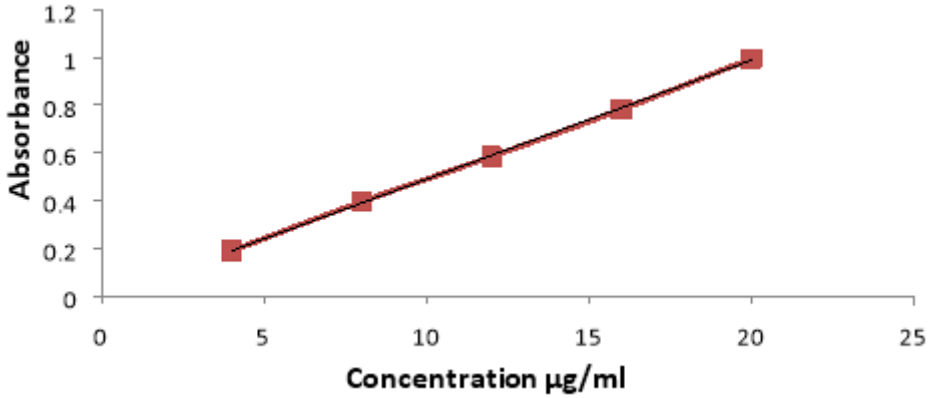

Fig. 3: Standard Plot of Ondansetron in 0.1N HCl.

The results of standard plot of OND in distilled water and 0.1N HCl is summarized in the table.

Table 6: The results of standard plot of OND in distilled water and 0.1N HCl.

Medium	R^2	Linear equation
Distilled water	0.9935	Y=0.0462x-0.0047
0.1N HCl	0.9997	Y=0.05x-0.0109

The standard linear equation thus obtained for distilled water and 0.1N HCl was further used in analysis of unknown drug.

Preformulation studies of OND

Pre-formulation studies were performed before any formulation to identify the physic-chemical properties of drug and any possible problems that can be rectified before formulation. In pre-formulation analysis, solubility determination of drug and drug-complex compatibility studies was carried out.

Solubility analysis

Solubility of drug was determined by shake flask method in distilled water. The data of solubility determination is given in table.

Table 7: Solubility analysis.

Medium	Solubility (mg/ml)	Average solubility(mg/ml)±S.D
Distilled water	0.024	0.0147±0.01
	0.016	
	0.014	

The solubility of the drug was found to be 0.0147± 0.01 (mg/ml) which showed low solubility. From literature drug demonstrated BCS class II drug which is low soluble & high permeable. This necessitates enhancement of solubility of drug. Complexation technique is used to enhance solubility of drug.

OND: HP-β-CD compatibility studies

The OND: HP-β-CD compatibility studies were carried out to determine any possible interaction between drug and complex used. The mixture of 1:1 ratio of OND: HP-β-CD was stored up to 1 month and FTIR analysis was done to determine the compatibility between them. The FTIR spectra of the physical mixture are shown in figure.

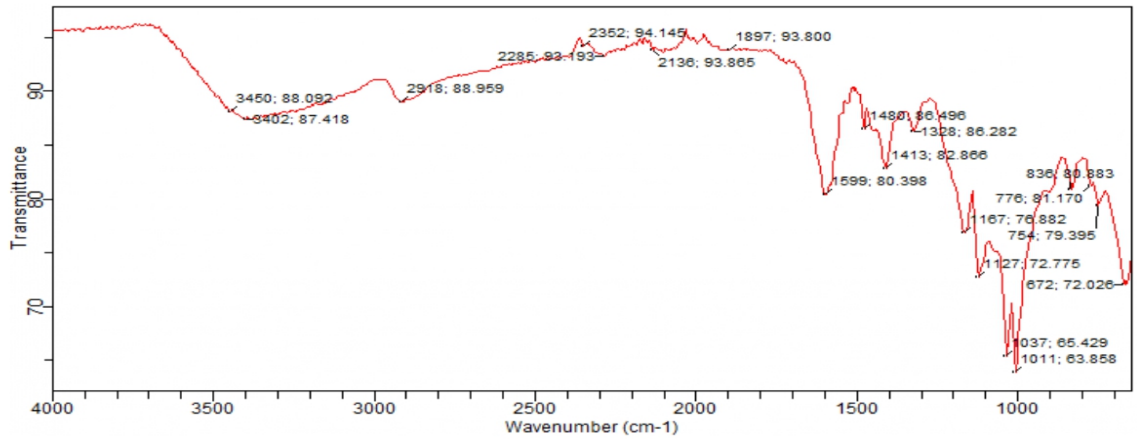

Fig. 4: FTIR spectra of HP-β-CD.

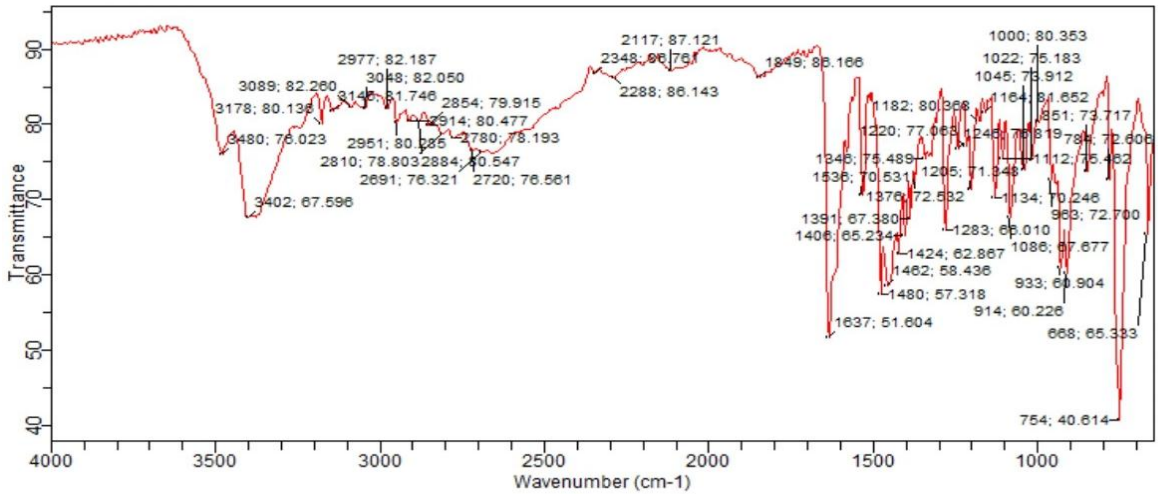

Fig. 5: FTIR Spectra of Ondansetron and HP-β-CD.

Table 8: Interpretation major peak of OND, HP-β-CD, Physical mixture.

IR bands		
OND(cm^{-1})	**HP-β-CD(cm^{-1})**	**Physical mixture(cm^{-1})**
3479	3368	3477
2920	2923	2922
1637	1640	1636
1531	1376	1531
1455	1459	1460

From the results of FTIR data, it was revealed that the characteristic peak of drug and complexing agent is retained in the physical mixture with slight modification in intensities. This indicated the absence of any chemical interaction between the drug and complexing agent used.

From the pre-formulation studies of OND, it was observed that OND is low aqueous soluble drug and the complexing agent used was compatible with the drug.

Formulation of complexes

Complexation technique was used to enhance solubility of drug. Complexation was achieved by Kneading technique. Complexing hydrophobic drug with hydrophilic carriers enhances the solubility of complexes drug and hence dissolution and bioavailability. HP-β-CD was used as hydrophilic complexing agent. Different molar of drug & HP-β-CD were used and are shown in table.

Table 9: Molar Ratio and quantity used in formulation.

Molar ratio	OND*	HP-β-CD**	Solvent used
1:0.5	293.36	687.685	Ethanol(1ml)
1:1	293.36	1375.371	
1:1.5	293.36	2063.05	
1:2	293.36	2750.74	

*Molecular weight of OND is 293.36 mg, ** Molecular weight of HP-β-CD is 1375.371 mg

Evaluation of complexes

Solubility determination

An accurately measured volume of distilled water was taken and equilibrium solution of drug and complex was prepared. The solubility of complex was increased as compared with drug and the enhancement ratio was calculated.

Table 10: Solubility's of OND & complexes.

Formulation Code	Ratio	Solubility (mg/ml)			Average 2±SD	Enhancement ratio
		A1	A2	A3		
Drug	1:0	0.024	0.016	0.014	0.0147±0.01	
C_1	1:0.5	0.2	0.253	0.301	0.251±0.05	17.07
C_2	1:1	2.38	2.67	3.43	2.82±0.54	191.83
C_3	1:1.5	0.19	0.25	0.301	0.247±0.05	16.80
C_4	1:2	0.253	0.29	0.33	0.231±0.03	15.71

The highest solubility was found in C_2 might be due to due to monomolecular complex formation of drug in C_1 formulation. The complexing agent might be insufficient for complex formulation and in C_3 and C_4 the excess complexing agent present reduced solubility.

C_1, C_3, & C_4 attained similar solubility without any significant difference.

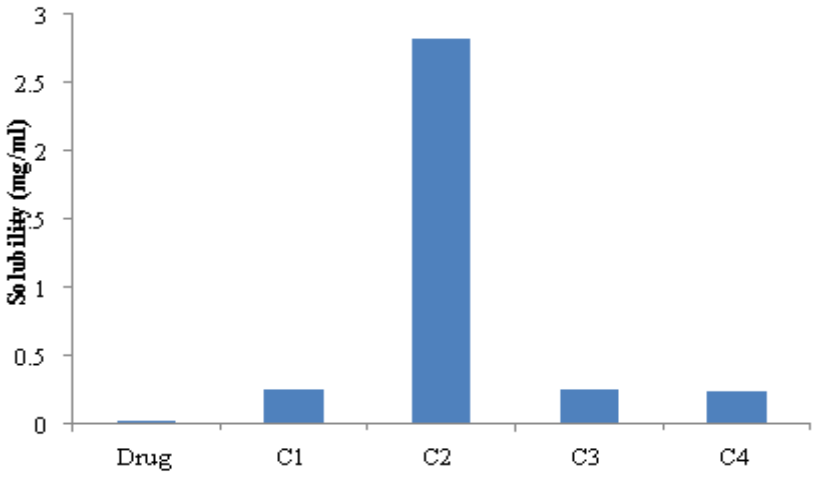

Fig. 6: Solubility's of OND & complexes.

The increase in solubility are in the order of $C_2>C_1>C_3>C_4$

Formulation of ODT

The tablet dosages form remained the most acceptable dosage form and easy to prepare also. The prepared complexes were then incorporated into tablets by direct compression. C_2 demonstrated highest solubility was used for preparation of ODT to further enhance the release rate. Fast disintegration of tablets was done by addition of Superdisintegrant in the formula.

Table 11: Formulation of ODT.

S.NO	INGREDIENTS	OST_1	OST_2	OST_3	OST_4
1	OND:HP-β-CD(1:1)	20	20	20	20
2	Crospovidone	4.375	8.75	13.125	17.5
3	PVP K30	6	6	6	6
4	Mannitol	25	25	25	25
5	Magnesium stearate	1.75	1.75	1.75	1.75
6	Avicel 102	117.875	113.5	109.125	104.75
Total(mg)		175	175	175	175

The results of evaluation of powders for compression-

Table 12: Evaluation parameter of powder.

Formulation code	Angle of Repose (^{0})	Bulk Density (gm/cm^3)	Tapped Density(gm/cm^3)	Carr's Index	Hausner Ratio
OST_1	13.79	0.674	0.761	11.43	1.07
OST_2	16.19	0.690	0.747	12.63	1.09
OST_3	16.78	0.720	0.739	12.92	1.12
OST_4	17.96	0.750	0.727	13.00	1.16

Angle of repose is within the range of 13-18^0 which showed excellent flow properties. Bulk density and tapped density is less than 1 gm/cm^2 which showed good compressibility properties. Carr's index is within the range of 12-16 which revealed good property. And Hausner Ratio is within the range of 1.12-1.18 which indicates ease flow properties.

The ODT prepared by direct compression were evaluated for various parameters such as Thickness, Hardness, Weight variation, Friability, Disintegration and *In vitro* release studies.

The thickness of tablets were in the range of 3.1-3.3 mm, hardness from 3.2 -3.5, weight variation in the range of 1.3 – 1.9, and friability range from 0.4 – 0.8.

Table 13: Evaluation of tablets.

Formulation code	Thickness (mm)	Hardness (kg/cm^2)	Weight variation %	Friability %	Disintegration time (sec)
OST_1	3.23	3.58	1.34	0.47	80
OST_2	3.13	3.51	1.98	0.78	70
OST_3	3.18	3.33	1.44	0.82	65
OST_4	3.34	3.26	1.57	0.87	60

The main criteria for ODT would be its disintegration time in the pH of saliva. The formulation showed its disintegration from 60 – 80 seconds in pH 6.8 phosphate buffer. The disintegration time was found to decrease with increase in concentration of Superdisintegrant. OST_4 showed minimum disintegration time. The decreasing order of disintegration time is as follows: OST_1> OST_2 > OST_3> OST_4. OST_4 was prepared with 10% Crospovidone.

***In vitro* drug release profile**

The In vitro release studies of various formulations were carried out in 0.1N HCl using USP apparatus II. The In vitro release data are as follows.

Table 14: In vitro drug release.

Time(min)	Cumulative drug release (%)			
	OST_1	**OST_2**	**OST_3**	**OST_4**
0	0	0	0	0
5	25.32	45.74	48.19	49.01
10	43.32	51.10	53.96	53.15
15	76.45	61.37	60.15	61.38
20	78.17	70.42	73.69	70.02
25	83.16	81.94	82.35	80.31
30	94.28	94.69	93.88	92.24

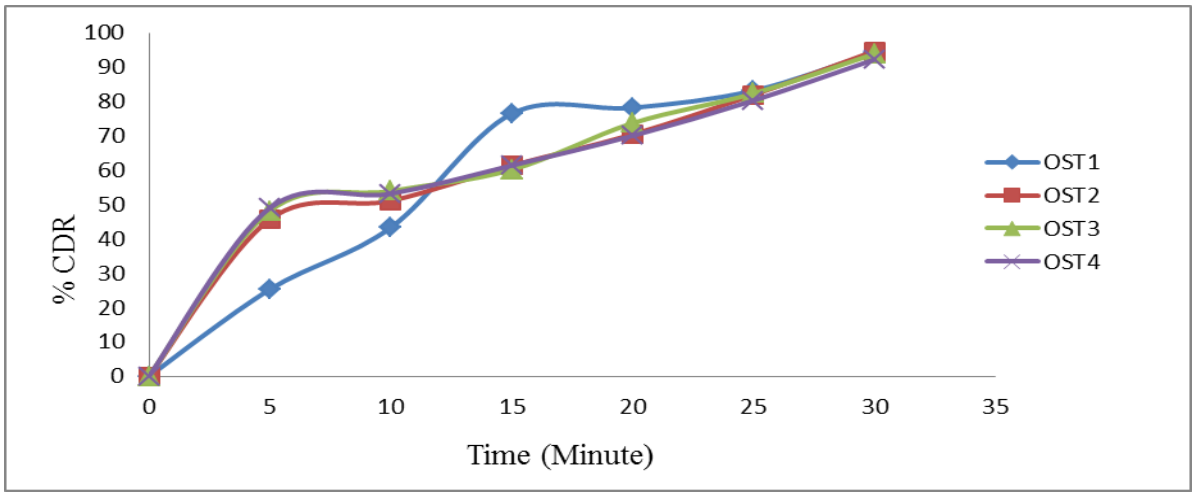

Fig. 7: Formulation Batch (OS T_1-OST_4) Vs % CDR.

The *In vitro* release of formulations was compared with release of marketed OND tablets. Tablets equivalent to 4mg was prepared**.**

Table 15: In vitro drug release of marketed OND.

Time (min)	% CDR
0	0
5	39.21
10	41.70
15	49.91
20	53.24
25	59.42
30	65.21

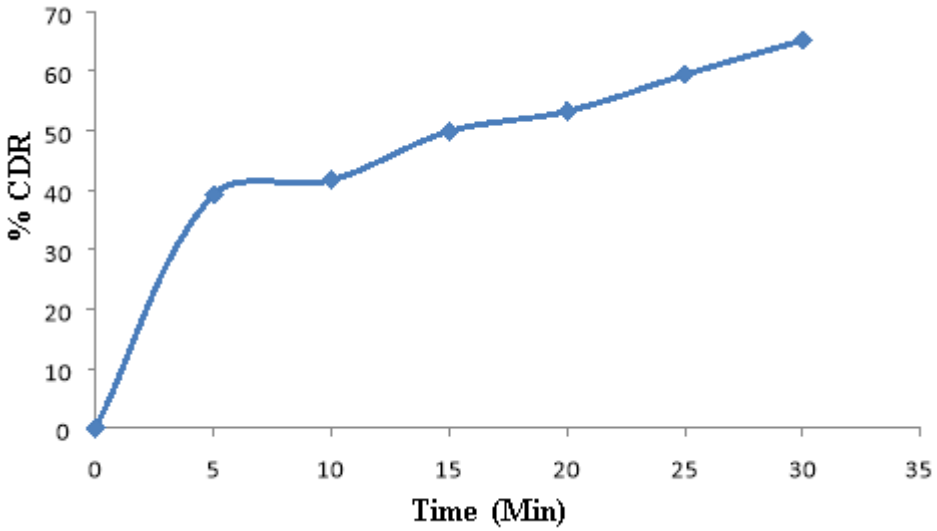

Fig. 8: In vitro drug release of marketed Formulation Vs % CDR.

The dissolution profile of different batches showed faster drug release. About 90% of drug was released within 30 minute in all batches where as in case of marketed tablets demonstrated only about 65% of drug release in 30 minute.

Within 10 minute, more than 50% of drug released in all batches except OST_1 which showed 43% drug release. The change in concentration of Superdisintegrant showed very less effect in dissolution of tablets. Initially the concentration of Superdisintegrant had its burst effect. The minimum concentration showed minimum release and more than 5% Superdisintegrant showed about drug release. After 5 minute the release pattern was similar with each other.

Table 16: Comparison of Formulation Dissolution Profile.

Formulations	f_2 value
Marketed & OST_1	38.29
Marketed & OST_2	42.78
Marketed & OST_3	41.78
Marketed & OST_4	43.51
OST_1 & OST_2	52.74
OST_1 & OST_3	50.75
OST_1 & OST_4	50.28
OST_2 & OST_3	85.74
OST_2 & OST_4	86.80
OST_3 & OST_4	86.98

f_2 values of dissolution profiles of different batches of tablets were compared with release of marketed tablets. The f_2 values were in the range of 38 to 43 indicated that the profile was showing significant different from the release of marketed tablets. Thus the release rate was faster in the prepared batches as compare to marketed tablets.

The dissolution profiles between were also compared. The f_2 values were found to be more than revealed that the release profile were similar. Therefore, varying the concentration of Superdisintegrant in the range of 2.5 to 10% w/w showed a difference in the release rate but none significantly.

Implementation and Conclusion

ODT have become popular dosage form recently as they possess the advantages of oral and liquid drug delivery systems. They are the most advanced and patient acceptable form of oral dosage forms due to more flexibility and comfort. They also provide an alternative means of delivering drug to geriatric, pediatric and bed ridden patients who have difficulty in swallowing the oral tablets and also fear of chocking. ODTs when placed in mouth come in contact with saliva, disintegrate and dissolve or disperse leading to quick absorption resulting in instant bioavailability of drug.

In the present study, ODT of Ondansetron containing HP-β- CD were prepared by direct compression using Superdisintegrant Crospovidone. 1:1 molar ratio was chosen and the complex was prepared by kneading method. The solubility of drug was found to be 0.018±0.005mg/ml and by complexing with HP-β-CD the solubility was increased up to 2.82±0.54mg/ml. Angle of repose, bulk density, tapped density; Carr's index and hausner

ratio all were in range according to the pharmacopoeia. Disintegration time was under the limit. The *In vitro* release was faster as compare to the marketed formulation.

ODT that were compressed using direct compression method were successful in fulfilling the objective of obtaining rapid disintegration and dissolution and therefore, would be able to provide quick action and relief in intolerable vomiting conditions.

ACKNOWLEDGMENT

I express my deep gratefulness to my guide for providing the facilities, co-operation guidance and independence for my research work.

Conflict of interest

Authors don't have any conflict of interest.

Source of funding

No source of funding.

REFERENCES

1. Dey P and Maiti S: Orodispersible tablets: A new trend in drug delivery. Journal of natural science, biological and medicin, 2010; 1(1): 2–5.
2. Akshay Kumar S, Gowda D V, Sharadha M, Akhila A R: The insights on Oro-dispersible tablet. International journal of research in pharmaceutical science, 2002; 11(1): 260-273.
3. Nagar P, Singh K, Chauhan I, Verma M, Yasir M, Khan A, Sharma R and Gupta N: Orally disintegrating tablets: formulation, preparation techniques and evaluation. Journal of Applied Pharmaceutical Science, 2011; 01(04): 35-45.
4. Ved Parkash, Maan S, Deepika, Yadav SK, Hemlata, and Jogpal V: Fast disintegrating tablets: Opportunity in drug delivery system. Journal of advanced pharmaceutical science and technology, 2011 Oct-Dec; 2(4): 223–235.
5. Kulshreshtha AK, Singh ON, Wall GM: Pharmaceutical Suspensions from Formulation Development to Manufacturing. Springer New York Dordrecht Heidelberg London. AAPS, 2010; 103-126. DOI: 10.1007/978-1-4419-1087-5_4
6. Ghosh T, ghosh A and Devi Prasad: A Review on New Generation Orodispersible Tablets and its Future Prospective. International Journal of Pharmacy and Pharmaceutical Sciences, 2011; 3(1): 1-7.

7. Elwerfalli AM, Ghanchi Z, Rashid F, Alany RG, ElShaer A: New Generation of Orally Disintegrating Tablets for Sustained Drug Release: A Propitious Outlook. Curr Drug Deliv, 2015; 12(6): 652-67.
8. Lopez FL, Ernest TB, Tuleu C, and Gul MO: Formulation approaches to pediatric oral drug delivery: benefits and limitations of current platforms. Expert Opin Drug Deliv, 2015 Nov 2; 12(11): 1727–1740.
9. Vora H, Modi D, Pandya V, Bharadia P, Patel M: Oral Dispersible Tablet: A Popular Growing Technology. Asian Journal of Pharmaceutical Research and Development, 2013; 1(6): 138-155.
10. Shinde A, Yadav V, Gaikwad V and Dange S: Fast Disintegration Drug Delivery System: a Review. International journal of pharmaceutical science and research, 2013; 4(7): 2548-2561.
11. Hannan PA, Khan JA, Khan A, and Safiullah S: Oral Dispersible System: A New Approach in Drug Delivery System. Indian Journal of Pharmaceutical Science, 2016; 78(1): 2–7.
12. Masih A, Kumar A, Singh S, Tiwari AK: Fast Dissolving Tablets: A Review. International Journal of Current Pharmaceutical Research, 2017; 9(2): 8-18.
13. Nehaben Gujarati: Oral Disintegrating Tablets: Background and Review on Recent Advancements. Advance Pharmaceutical Journal, 2017; 2(2): 54-64.
14. Hirani1 JJ, Rathod DA, Vadalia KR: Orally Disintegrating Tablets: A Review. Tropical Journal of Pharmaceutical Research, April 2009; 8(2): 161-172.
15. Chowdary KPR, Shankar KR and Suchitra B: Recent Research on Orodispersible Tablets – A Review. International Research Journal of Pharmaceutical and Applied Sciences, 2014; 4(1): 64-73.
16. Rahane1 RD, Rachh PR: A Review on Fast Dissolving Tablet. Journal of Drug Delivery & Therapeutics, 2018; 8(5): 50-55.
17. Gupta A, Mishra AK, Gupta V, Bansal P, Singh R, Singh AK: Recent Trends of Fast Dissolving Tablet - An Overview of Formulation Technology. International Journal of Pharmaceutical & Biological Archives, 2010; 1(1): 1 – 10.
18. Saka M and Singh S: A Review on Advancement in Mouth Dissolving Tablets. Research Journal of Pharmaceutical, Biological and Chemical Sciences, 2012; 3(4): 824.
19. Patil SM. Godsel Z. Saudagar RB: Solubility Enhancement by Various Techniques. World Journal of Pharmacy and Pharmaceutical Sciences, 2013; 2: 4558-4572.

20. Roy A: Orodispersible Tablets: A Review. Asian Journal of Pharmaceutical and Clinical Research, 2016; 9(1): 19-26.
21. Srivastava S, Bala R, Joshi B, Rana AC, Singh V:Mouth Dissolving Tablet: A future Compaction. International Research Journal of Pharmacy, 2012; 3(8): 98-109.
22. Patel DM and Patel MM: Optimization of Fast Dissolving Etoricoxib Tablets Prepared by Sublimation Technique. Indian Journal of Pharmaceutical sciences, 2008; 2: 300-320.
23. Bhowmik D, Chiranjib B, Krishnakanth, Pankaj, Chandira RM: Fast Dissolving Tablet: An Overview. Journal of Chemical and Pharmaceutical Research, 2009; 1(1): 163-177.
24. Sharma D: Formulation Development and Evaluation of Fast Disintegrating Tablets of Salbutamol Sulphate for Respiratory Disorders. Hindawi Publishing Corporation ISRN Pharmaceutics, 2013; 2013: 1-8.
25. Sawant K. Gossai RA and Patil BS: Formulation and Evaluation of Oro Dispersible Tablets of Ondansetron Hydrochloride by Direct Compression Using Superdisintegrant. International Journal of Pharmaceutical Sciences and Nanotechnology, 2008; 1: 100-120.
26. Shah AN, Cadinu D, Henke RM, Xin X, Dastidar RG Zhang L: Deletion of a subgroup of ribosome-related genes minimizes hypoxia-induced changes and confers hypoxia tolerance. Physiology Genomics, 2011; 43(14): 855-72.
27. Ramanjaneyulu G and Reddy BR: Optimization of Xylanase Production through Response Surface Methodology by Fusarium sp. BVKT R2 Isolated from Forest Soil and Its Application in Saccharification, 2016; 7: 1-16.
28. Bansal AK, Bilaspuri GS: Impacts of Oxidative Stress and Antioxidants on Semen Functions. Recent Advances in Reproductive Technologies, 2011; 01-07. DOI: 10.4061/2011/686137
29. Revision of Monograph on Tablets. Final Fext for Addition to The International Pharmacopoeia. World Health Organization.
30. https://www.who.int/medicines/publications/pharmacopoeia/Tabs-GeneralMono-rev-FINAL_31032011.pdf.
31. Kot B, Piechota M, Wolska KM, Frankowska A, Zdunek E, Binek T, Kłopotowska E, Antosiewic M: Phenotypic and genotypic antimicrobial resistance of staphylococci from bovine milk. Polish Journal of Veterinary Sciences, 2012; 15(4): 677-683
32. Wang G, Sawant P, Ishii M: A new entrainment rate model for annular two-phase flow. International Journal of Multiphase Flow, 2020; 124: 103185.

33. Yadav A: Saccharomyces cerevisiae Gpi2, an accessory subunit of the enzyme catalyzing the first step of glycosylphosphatidylinositol (GPI) anchor biosynthesis, selectively complements some of the functions of its homolog in Candida albicans. Glycoconj Journal, 2014; 31(6-7): 497-507.
34. Kumar DN, Patra A, and Chatterjee PN, Kumar R: Effect of plant extracts on methanogenesis and microbial profile of the rumen of buffalo: A brief overview. Animal Production Science, 2008; 48(2): 175-178.