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Research Article

**FORMULATION AND EVALUATION TOPICAL GEL OF
ONDANSETRON**Aarthi patil¹, Dr. Nazemoon²¹ Student, Department of Pharmaceutics, Bharat Institute of Technology.² Professor, Department of Pharmaceutics, Bharat Institute of Technology.**Abstract:**

Objective: This study aimed to formulate and evaluate a topical gel containing ondansetron, a potent antiemetic, to explore its potential as an alternative delivery system for managing nausea and vomiting.

Methods: Ondansetron topical gel was formulated using various gelling agents and excipients to optimize its physicochemical properties. The formulations were evaluated for gel consistency, pH, drug content, in vitro drug release.

Results: The developed topical gels exhibited suitable consistency and pH levels, with optimal drug content uniformity. In vitro release studies indicated a controlled release profile, supporting sustained drug delivery.

Conclusion: The ondansetron topical gel formulations were successfully developed, demonstrating desirable properties such as sustained release and minimal skin irritation. This alternative delivery system holds promise for improving patient compliance and comfort in the management of nausea and vomiting.

Keywords: Ondansetron Topical Gel, HPMC, Sodium Cmc and Carbopol-934

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INTRODUCTION:

The topical/transdermal (TT) delivery route for drug administration has many advantages over other pathways including avoiding the hepatic first pass effect, continuous drug delivery, fewer side effects and improved patient compliance¹. Topical drug products are intended for external use. They are intended for localization action on one or more layers of the skin (e.g., sun screens, keratolytic agents, local anesthetics, antiseptic and anti-inflammatory). Although some medication from these topical products may unintentionally reach systemic circulation, It is usually in subtherapeutic concentrations and does not produce effects of any major concern except possibly in special situations, such as pregnant or nursing patient². In topical applications the total quantity of active ingredient absorbed varies greatly based on many factors including application area size, the frequency and vigor of application and the viscosity or thickness of the applied vehicle. Other factors influencing drug absorption are application site, age and condition of the skin. Non-keratinized dermis is more easily penetrated by an active ingredient. In the optimum topical formulations, the drug diffusion through skin is controlled by ensuring that the drug is just soluble enough in the vehicle to encourage drug release at the desired rate. This is achieved by ensuring that the entire drug is in solution.³ In general, topical vehicles do not penetrate the skin and merely hold the active ingredient in place on the skin to enable drug absorption. The vehicle should be carefully selected, as it can influence the absorption of the drug through skin.⁴ Dermatological products applied to the skin are diverse in formulation and range in consistency from liquids to solid powder, but the most popular products are semisolid preparation.⁵ To a very large extent, when the pharmaceutical industry must deliver drugs through the skin, it has shown a distinct preference for transdermal patches, rather than gels. However, patch design demand that all the medication contained within the device is delivered though a very limited area of skin. Delivery of such concentrated quantities of medication across a few square centimeters of skin can prove highly irritating to many individuals especially those who are sensitive to adhesives. This can traumatize the skin of sensitive individuals and the elderly.⁶ The term 'Gel' was introduced in the late 1800 to name some semisolid material according to their physiological characteristics rather than molecular composition. Gels are semisolid systems in which a liquid phase is constrained within a three dimensional polymeric matrix of natural or synthetic gums in which a high degree of physical or chemical cross linking has been established⁸. Most topical gels are prepared with

organic polymers, such as carbomers, that impart an aesthetically pleasing, clear, sparkling appearance to the products and are easily washed off from the skin with water. The type of base used in formulating a topical dermatological product greatly influences its effectiveness. Bases containing large amounts of oleaginous substances provide an emollient effect to dry irritated skin. More importantly, bases made up of non-volatile oleaginous substances (e.g. hydrocarbon bases) can form an occlusive barrier on the skin that prevents escape of moisture from the skin into the environment. As a result, moisture accumulates between the skin and the ointment layer that cause hydration of the stratum corneum. Hydration of stratum corneum all 'opening up' of intra and inter-cellular channels and pathway for easier passage of drug molecules. Additionally, the moisture layer provides a medium for dissolution of the drug that is otherwise dispersed as fine particles in the ointment base. Since only the dissolved drug presented to the skin, as an individual molecular entity is able to enter the stratum corneum, skin occlusion generally results in enhanced percutaneous drug absorption⁹.

Gels are the semi-rigid systems in which the movement of the dispersing medium is restricted by interlacing of three-dimensional network of the particles or solvated macromolecules of the dispersed phase. The increased viscosity caused by the interlacing and consequential internal function is responsible for the semi-solid state. When dispersed in an appropriate solvent, gelling agents merge or entangle to form a three dimensional colloidal network structures. This network structure is also responsible for a gels resistance to deformation and therefore its viscoelastic properties. The elasticity of certain gels may be due to the presence of double helix structure, similar to a water uptake capacity and to the rheological profile of each polymer tested¹⁰.

Ondansetron is a serotonin 5-HT₃ receptor antagonist used to prevent nausea and vomiting in cancer chemotherapy and postoperatively. A competitive serotonin type 3 receptor antagonist. It is effective in the treatment of nausea and vomiting caused by cytotoxic chemotherapy drugs, including cisplatin, and has reported anxiolytic and neuroleptic properties. Having been developed in the 1980s by GlaxoSmithKline and approved by the US FDA since January 1991, ondansetron has demonstrated a long history of use and efficacy. Commonly formulated as oral tablets, orally disintegrating tablets (ODT), and injections, and available as generic products as well, ondansetron continues to see contemporary innovations in its formulation and use, including the development of orally soluble films that are both

discreet in administration and less of a burden in comparison to having patients attempt to swallow pills during emesis.¹¹⁻¹²

The main aim is to develop and evaluate a topical gel formulation of ondansetron that provides effective local delivery of the drug for symptomatic relief, with a focus on, efficacy, and user acceptability.

MATERIAL AND METHODS:

Table 1: List of Materials Used

Name of the material	Source
Ondansetron	Provided by SURA LABS
HPMC15	Merck Specialities Pvt Ltd, Mumbai, India
Carbopol-934	Merck Specialities Pvt Ltd, Mumbai, India
Sodium CMC	Merck Specialities Pvt Ltd, Mumbai, India
Triethanolamine	Merck Specialities Pvt Ltd, Mumbai, India

METHODOLOGY:

Analytical method development:

a) Determination of absorption maxima:

100mg of Ondansetron pure drug was dissolved in 15ml of Methanol and make up to 100ml with 0.1N HCL (stock solution-1). 10ml of above solution was taken and make up with 100ml by using 0.1 N HCL (stock solution-2 i.e. 100µg/ml). From this 10ml was taken and make up with 100 ml of 0.1 N HCL (10µg/ml). Scan the 10µg/ml using Double beam UV/VIS spectrophotometer in the range of 200 – 400 nm

b) Preparation calibration curve:

100mg of Ondansetron pure drug was dissolved in 15ml of Methanol and volume make up to 100ml with 0.1N HCL (stock solution-1). 10ml of above solution was taken and make up with 100ml by using 0.1 N HCL (stock solution-2 i.e. 100µg/ml). From this take 5, 10, 15, 20, 25 and 30ml of solution and make up to 100ml with 0.1N HCL to obtain 5, 10, 15, 20, 25 and 30µg/ml of Ondansetron solution. The absorbance of the above dilutions was measured at 248nm by using UV-Spectrophotometer taking 0.1N HCL as blank. Then a graph was plotted by taking Concentration on X-Axis and Absorbance on Y-Axis which gives a straight line. Linearity of standard curve was assessed from the square of correlation coefficient (R^2) which determined by least-square linear regression analysis. The experiment was performed in triplicate and based on average absorbance; the equation for the best line was generated. The results of standard curve preparation are shown in Table-and figure

Drug – Excipient compatibility studies

Fourier Transform Infrared (FTIR) spectroscopy:

Drug excipient interaction studies are significant for the successful formulation of every dosage form. Fourier Transform Infrared (FTIR) Spectroscopy studies were used for the assessment of physicochemical compatibility and interactions, which helps in the prediction of interaction between drug and other excipients. In the current study 1:1 ratio was used for preparation of physical mixtures used for analyzing of compatibility studies. FT-IR studies were carried out with a Bruker, ATR FTIR facility using direct sample technique.

METHOD OF PREPARATION

STEP1:

Preparation of emulsion using oil phase and water phase by emulsification method. Drug can be incorporated either in oil or aqueous phase depending upon its solubility.

STEP2:

Formulation of gel base by using hydrocolloids by soaking in warm water.

STEP3:

Third step after cooling, a prepared emulsion is incorporated into preformed gel and stir to uniform disperse emulsion into gel base.

Preparation of Ondansetron gel

Different formulations were prepared using varying amount of gelling agent. The method only differed in process of making gel in different formulation. The preparation of emulsion was same in all the formulations. The gel bases (HPMC15, Carbopol-934 and Sodium CMC) were prepared by dispersing in distilled water separately with constant stirring at a moderate speed using mechanical shaker. Formulations OD1, OD2 and OD3 were prepared by HPMC15 934; OD4, OD5 and OD6 by Carbopol-934; OD7, OD8, and OD9 by Sodium CMC as gelling agent. In formulations the gel were prepared

by dispersing base in heated distilled water (75°C) and the dispersion was cooled and left overnight. The pH of all the formulations was adjusted to 5.5 to 6.5 using tri ethanol amine (TEA). Methyl paraben were dissolved in propylene glycol and mixed with aqueous phase Ondansetron being hydrophobic was dissolved in oil phase. Both the oily and aqueous

phases were separately heated to 70° to 80°C, then the oily phase was added to the aqueous phase with continuous stirring until it got cooled to room temperature. The obtained emulsion was mixed with the gel in 1:1 ratio with gentle stirring to obtain the gel. The composition of different formulations has been discussed in Table 2.

Table No: 2 Composition of gel formulation

COMPOSITION OF GEL FORMULATIONS (%W/W)									
Formulation code	OD1	OD2	OD3	OD4	OD5	OD6	OD7	OD8	OD9
Ondansetron	2%	2%	2%	2%	2%	2%	2%	2%	2%
HPMC15	2	4	6	--	--	--	--	--	--
Carbopol-934	--	--	--	2	4	6	--	--	--
Sodium CMC	--	--	--	--	--	--	2	4	6
Triethanolamine	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Liquid paraffin	6	6	6	6	6	6	6	6	6
Alcohol	3	3	3	3	3	3	3	3	3
Span 80	4	4	4	4	4	4	4	4	4
Tween 80 in ml	2	2	2	2	2	2	1	2	2
Propylene glycol	6	6	6	6	6	6	6	6	6
Water	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S

Characterization of Gellified Emulsion

1. Physical appearance

The prepared Emulsion formulations were inspected visually for their color, homogeneity, consistency and pH. The pH values of 1% aqueous solutions of the prepared Gellified Emulsion were measured by a pH meter (Digital pH meter).

2. Rheological Study

The viscosity of the different gel formulations is determined at 25°C using a cone and plate viscometer with spindle 52 (Brookfield Engineering Laboratories,) and connected to a thermostatically controlled circulating water bath.

3. Spreadability

Spreadability is determined by apparatus suggested by which is suitably modified in the laboratory and used for the study. It consists of a wooden block, which is provided by a pulley at one end. By this method, spreadability is measured on the basis of 'Slip' and 'Drag' characteristics of gels. A ground glass slide is fixed on this block. An excess of gel (about 2 gm.) under study is placed on this ground slide. The gel is then sandwiched between this slide and another glass slide having the dimension of fixed ground slide and provided with the hook. A 1 Kg weight is placed on the top of the two slides for 5 minutes to expel air and to provide a uniform film of the gel between the slides. Excess of the gel is

scrapped off from the edges. The top plate is then subjected to pull of 80 gm. With the help of string attached to the hook and the time (in seconds) required by the top slide to cover a distance of 7.5 cm be noted. A shorter interval indicates better spreadability. Spreadability was calculated by using the formula,

$$S = M.L/T$$

Where, S = spreadability,

M = Weight tied to upper slide,

L = Length of glass slides

T = Time taken to separate the slides completely from each other.

4. Extrudability study

It is a usual empirical test to measure the force required to extrude the material from tube. The method applied for determination of applied shear in the region of the rheogram corresponding to a shear rate exceeding the yield value and exhibiting consequent plug flow. In the present study, the method adopted for evaluating gel formulation for extrudability is based upon the quantity in percentage of gel and gel extruded from lacquered aluminum collapsible tube on application of weight in grams required to extrude at least 0.5 cm ribbon of gel in 10 seconds. More quantity extruded better is Extrudability. The measurement of extrudability of each formulation is in triplicate and the average

values are presented. The extrudability is then calculated by using the following formula:

Extrudability = Applied weight to extrude gel from tube (in gm.) / Area (in cm)

5. Drug Content Determination

Drug concentration in Gellified Emulsion was measured by spectrophotometer. Drug content in Gellified Emulsion was measured by dissolving known quantity of Gellified Emulsion in solvent (methanol) by Sonication. Absorbance was measured after suitable dilution in UV/VIS spectrophotometer (UV -1700 CE, Shimadzu Corporation, Japan).

6. In Vitro Release Study

Franz diffusion cell (with effective diffusion area 3.14 cm² and 15.5 ml cell volume) Was used for the drug release studies. Gellified Emulsion (200 mg) was applied onto The surface of egg membrane evenly. The egg membrane was clamped between the donor and the receptor chamber of diffusion cell. The receptor chamber was filled with freshly prepared PBS (pH 5.5) solution to solubilize the drug. The receptor chamber was stirred by magnetic stirrer. The samples (1.0 ml aliquots) were collected at suitable time interval. Samples were analyzed for drug content by UV visible spectrophotometer after appropriate dilutions. Cumulative corrections were made to obtain the total amount of drug release at each time interval. The cumulative amount of drug released across the egg membrane was determined as a function of time.

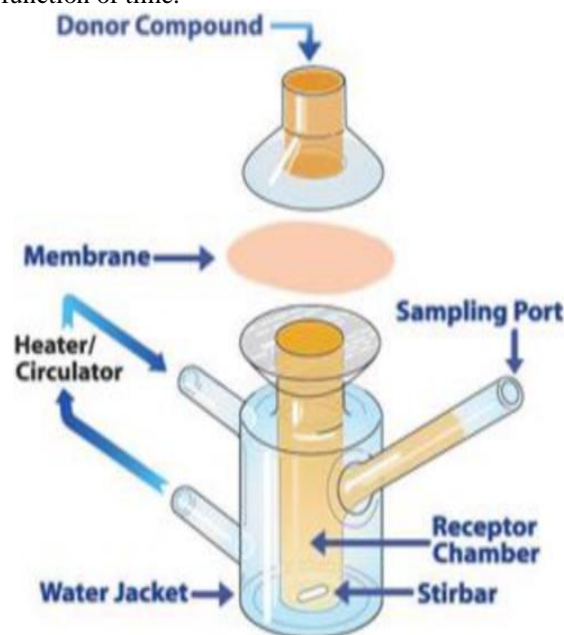


Figure.No:1 Franz diffusion cell

Equation used to determine drug release

1. Higuchi's equation

$$Q = k_2 \sqrt{t}$$

Q = Percent of drug release at time t. k_2 = Diffusion rate constant.

2. Zero-order equation

$$Q = k_0 t$$

Where-

Q = Amount of drug release at time t. k_0 = Zero order release rate.

3. First-order equation

$$\ln = (100-Q) = \ln 100 - k_1 t$$

Where-

Q = Percent of drug release at time t.

k_1 = the first order release rate constant.

RESULTS AND DISCUSSION

A unique feature of topical drug delivery is the direct accessibility of the skin as a target organ for diagnosis and treatment. Topical drug delivery system offer several advantages over oral drug delivery systems. Oral drug delivery system produced many side effect so overcome the side effect of the oral dosage form, the drug was formulated in to topical drug delivery system i.e. gel. Gel formulation of Ondansetron was prepared using 4 types of gelling agent: HPMC15, Carbopol-934 and Sodium CMC as polymers. Ondansetron, used for the topical as vaginal yeast infections, oral thrush, diaper rash, tinea versicolor, and types of ringworm including athlete's foot and jock itch. In the present study, an attempt was made to formulate topical gel of DRUG for efficient delivery of drug across the skin.

Analytical Method

Standard graph of Ondansetron in 0.1N HCl:

The scanning of the 10 µg/ml solution of Ondansetron in the ultraviolet range (200-400nm) against 0.1 N HCl the maximum peak observed at λ_{max} as 248nm. The standard concentrations of Ondansetron (5-30) µg/ml) was prepared in 0.1N HCl showed good linearity with R^2 value of 0.998, which suggests that it obeys the Beer-Lamberts law.

Table No. 3: Standard Curve of Ondansetron in 0.1 N HCl		
S.No	Concentration $\mu\text{g/ml}$	Absorbance
1.	0	0
2.	5	0.109
3.	10	0.207
4.	15	0.304
5.	20	0.408
6.	25	0.511
7.	30	0.608

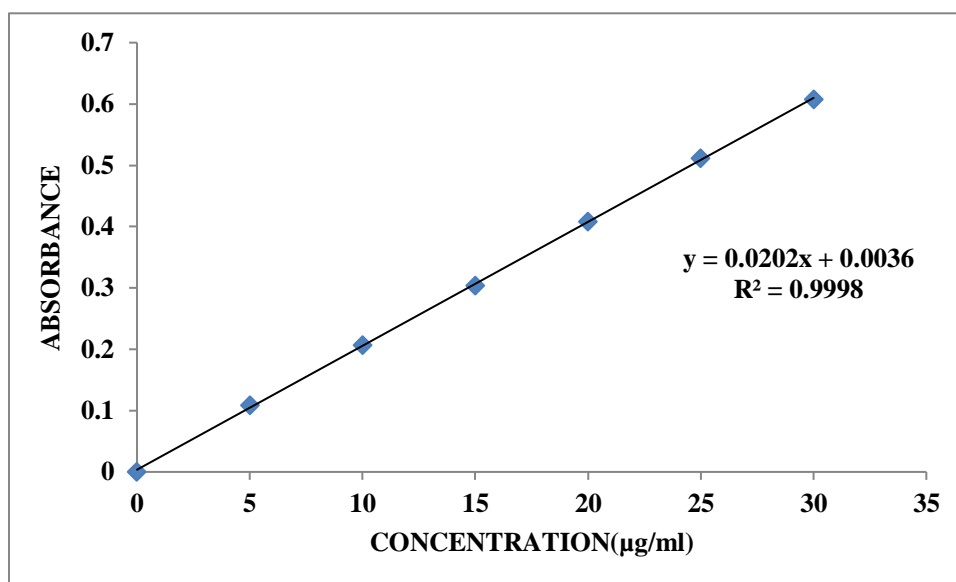


Figure No.2: Standard Curve of Ondansetron in Phosphate buffer pH 0.1N HCl

The scanning of the $10\mu\text{g/ml}$ solution of Ondansetron in the ultraviolet range (200-400nm) against 6.8 pH the maximum peak observed at λ_{max} as 248 nm. The standard concentrations of Ondansetron (5-30) $\mu\text{g/ml}$ was prepared in pH 6.8 showed good linearity with R^2 value of 0.9998, which suggests that it obeys the Beer-Lamberts law.

Table No. 4: Standard Curve of Ondansetron in pH 6.8		
S. No	Concentration $\mu\text{g/ml}$	Absorbance
1.	0	0
2.	5	0.107
3.	10	0.219
4.	15	0.331
5.	20	0.437
6.	25	0.543
7.	30	0.647

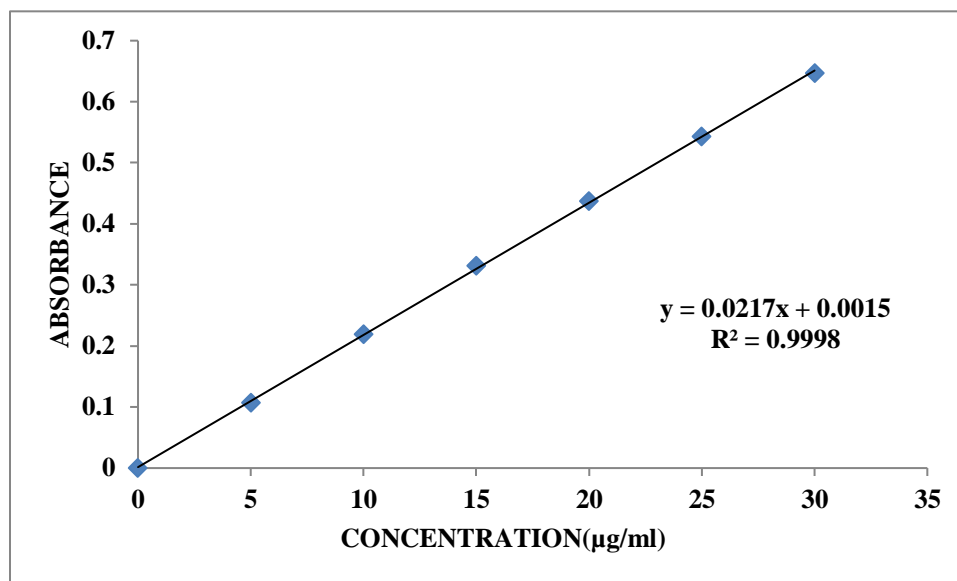


Figure No.3: Calibration curve of Ondansetron in pH 6.8 at 255nm

Drug and Excipient Compatibility Studies FTIR study

From the FTIR data it was evident that the drug and excipients does not have any interactions. Hence they were compatible

Physical Examination

The prepared gellified emulsion formulations were white, viscous, and creamy preparations, with a smooth and homogeneous appearance, as given in table. Incorporation of propylene glycol as a humectant not only provided the optimum spreadability to the product, but also improved the aesthetic appearance. HPMC15+Carbopol-934 as a gelling agent helped to achieve the desired viscosity, thereby affecting the homogeneity as well as the spreadability of the final preparations. There was no sign of phase separation in any of the preparations.

Table No. 5: Physicochemical characteristics of gel

S.No.	Formulation code	Color	Phase separation	Grittiness	Homogeneity	Consistency
1	OD1	White	None	-	Fair	+
2	OD2	White	None	-	Fair	+
3	OD3	White	None	-	Fair	+
4	OD4	White	None	-	Good	++
5	OD5	White	None	-	Good	++
6	OD6	White	None	-	Good	++
7	OD7	White	None	-	Excellent	+++
8	OD8	White	None	-	Excellent	+++
9	OD9	White	None	-	Excellent	+++

Measurement of pH

The pH of gel formulations was determined by using digital pH meter. One gram of gel was dissolved in 100 ml of distilled water and it was placed for two hours. The measurement of pH of each formulation was done in triplicate and average values were calculated. The pH of the gel formulations was in range which lies in the normal pH range of the skin and would not produce any skin irritation. There was no significant change in pH values as a function of time for all formulations. The data is reported in Figure.

Table No. 6: Different formulations Parameters						
S. No.	Formulation code	pH	Viscosity	Spreading Coefficient	Extrudability	Drug content
1	OD1	6.18	6985	17.8	11.9	99.18
2	OD2	6.51	7257	18.4	12.4	98.12
3	OD3	5.92	8512	17.7	14.7	97.35
4	OD4	6.21	3055	22.3	8.2	98.88
5	OD5	6.38	4821	27.5	11.6	99.18
6	OD6	6.51	5218	33.2	12.5	98.42
7	OD7	6.32	8782	34.6	13.4	100.65
8	OD8	6.81	9756	36.7	16.5	97.26
9	OD9	5.89	9188	41.9	18.7	99.22

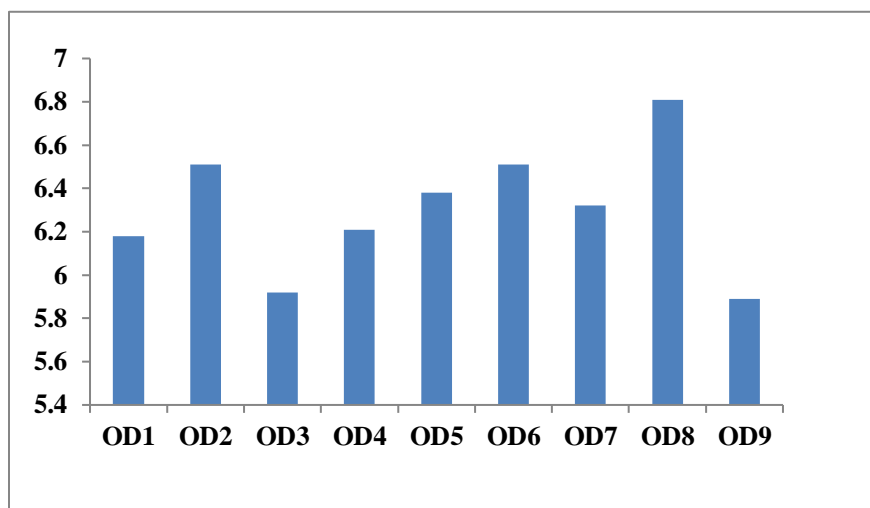


Figure No.4: pH of different formulations OD1- OD9

Viscosity of Gellified emulsions

All of the prepared formulations possessed optimum viscosity. Since, the type and quantity of the gelling agent in each formulation was the same, inclusion of different bases to have brought about some difference in the viscosity of the gellified emulsions. While OD9 was the most viscous formulation, OD4 had the least viscosity.

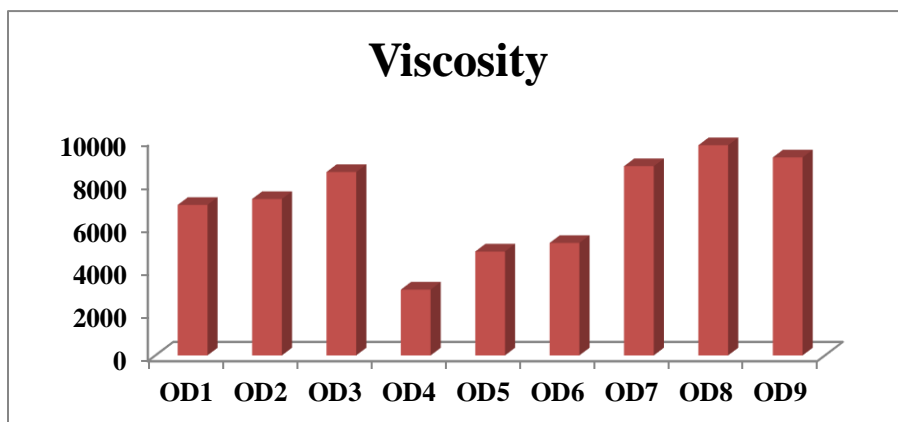


Figure No.5: Viscosity of different formulations OD1- OD9

SPREADABILITY: The values of the spreadability indicated that the gellified emulsions were easily spreadable by small amount of shear. Formulation OD9 gave the highest value for spreadability.

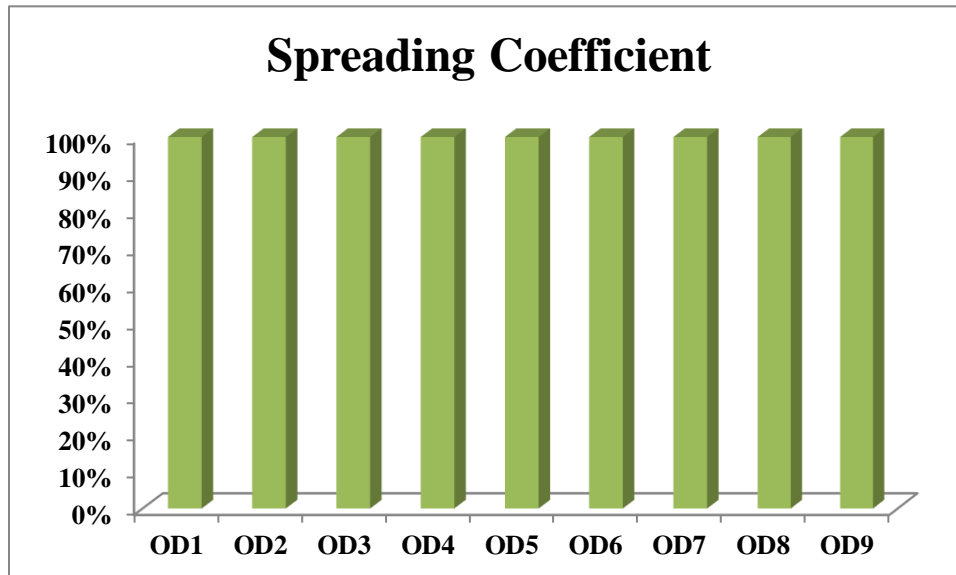


Figure No.6: Spreading Coefficient of different formulations OD1- OD9

Extrudability: The gels were filled into collapsible tubes after formulating them. The extrudability of the formulation has been checked and the results were shown in Table Figure

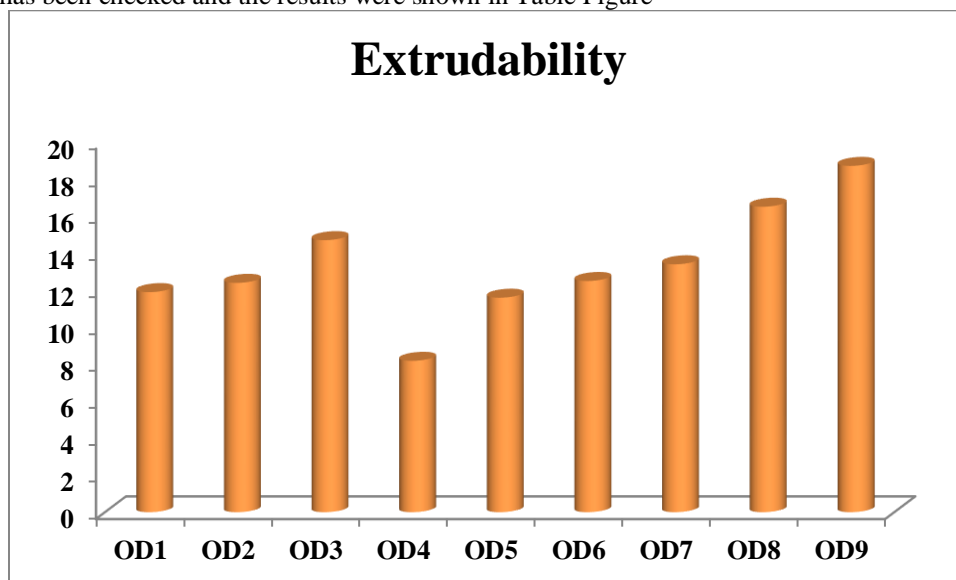


Figure No.7: Extrudability of different formulations OD1- OD9

Drug content:

The percent drug content in gellified emulsions was found to fall in the range of 97.85 to 100.05.

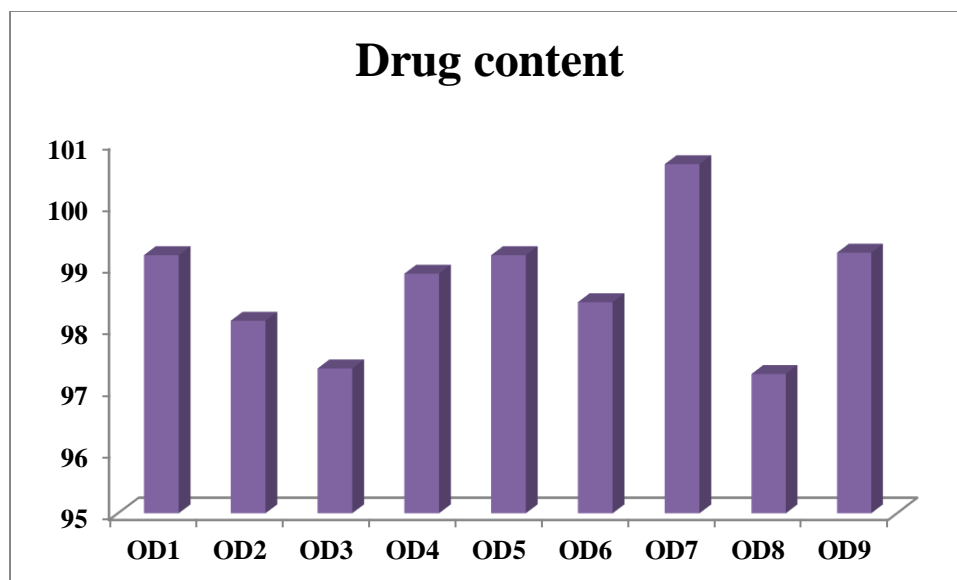


Figure No.8: Percentage drug content of different formulations OD1- OD9

Table No. 7: Dissolution Data of gel containing Ondansetron by using various polymers

Time(Min)	OD1	OD2	OD3	OD4	OD5	OD6	OD7	OD8	OD9
0	0	0	0	0	0	0	0	0	0
15	33.54	29.31	22.65	47.80	36.91	33.31	29.49	21.69	24.41
30	48.26	37.18	38.35	63.93	47.11	45.92	39.36	33.31	35.19
45	57.87	52.49	47.42	69.46	59.98	57.46	47.08	37.13	40.10
60	72.13	59.34	54.09	81.04	69.32	62.27	55.99	49.06	48.02
90	79.01	66.79	59.81	89.57	79.58	71.43	63.21	57.69	53.36
120	88.23	73.80	69.94	95.94	89.89	77.89	69.45	63.38	59.67
150	92.98	79.05	75.19		96.33	85.97	77.97	69.42	67.18
180	95.53	85.23	82.03		97.91	90.46	78.25	75.60	73.65
210		88.31	87.73			94.62	89.85	79.09	78.61
240		95.96	95.61			95.38	93.04	86.32	83.62
270		97.47	97.66				95.67	95.16	88.15
300			98.18					97.09	98.28

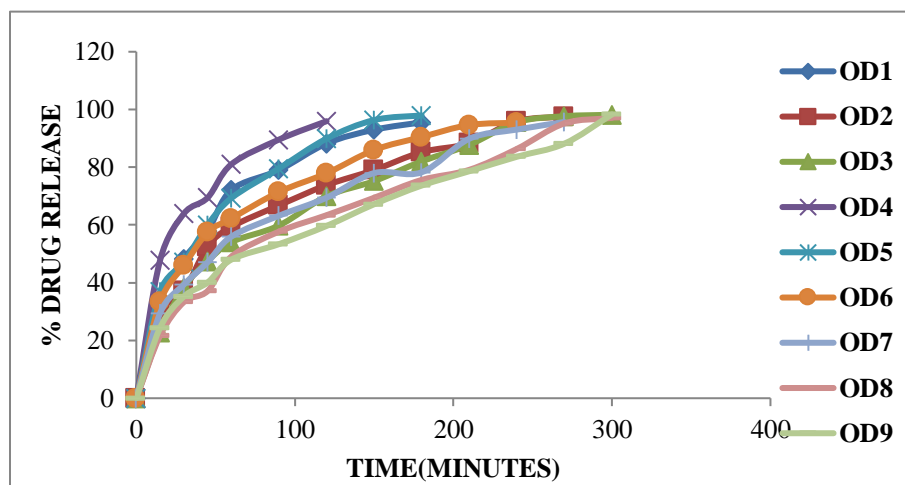
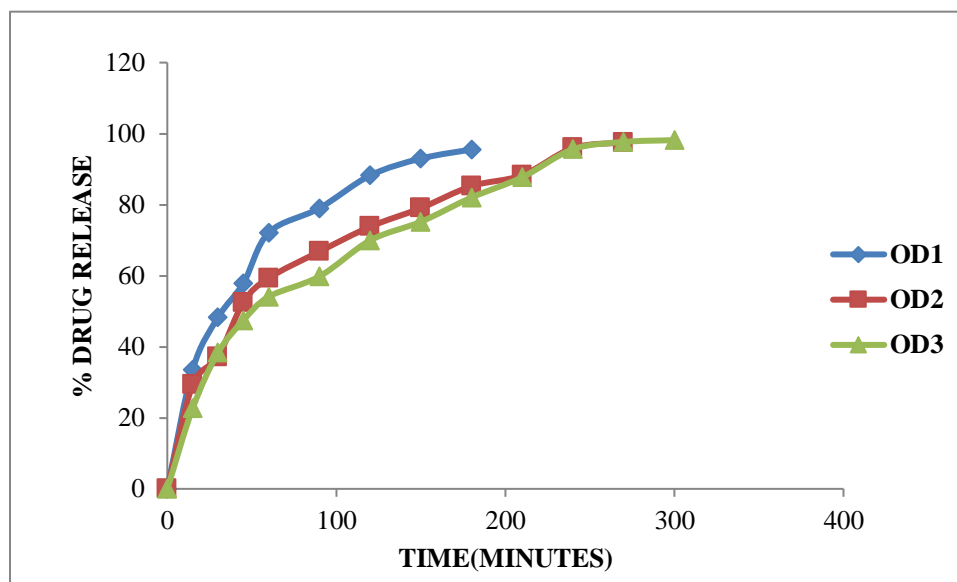
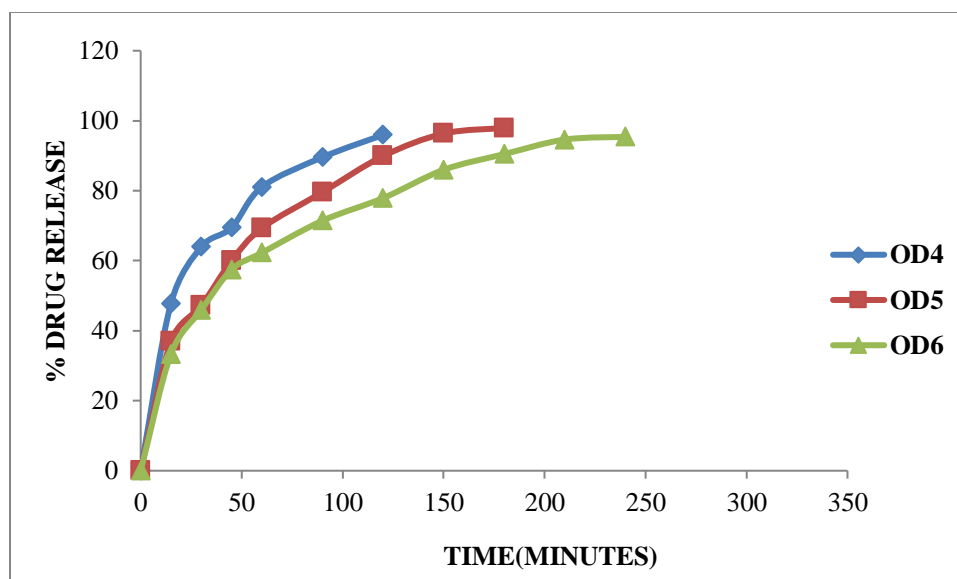


Figure No.9: Diffusion study of gel containing Ondansetron with Croscopovidone, Cros carmellose sodium and Sodium starch glycolate (OD1 to OD9)

Figure No.10: Diffusion study of gel containing Ondansetron with Crospovidone (OD1 to OD3)

The % drug release of OD1 to OD3 formulations depends on concentration of polymer/gelling agent in the formulation. The **Carbopol-934** 1:1 and ratio was unable to retard the drug release up to desired time. The ratio of drug and **Carbopol-934** 1:1.5 was unable retard the drug release up to 5 hrs. In OD3 formulations, **Carbopol-934** ratio is 1:3 showed maximum % drug release i.e. 98.18 at 5 hours.

**Figure No.11: Diffusion study of gel containing Ondansetron with HPMC-5 (OD4 to OD6)**

The % drug release of OD4 to OD6 formulations depends on concentration of polymer/gelling agent in the formulation. The **HPMC-5** 1:1 and ratio was unable to retard the drug release up to desired time. When the ratio of drug and **HPMC-5** 1:1.5 was unable retard the drug release up to 3 hrs. In OD5 formulations, **HPMC-5** ratio is 1:3 showed maximum % drug release i.e. 97.91 at 4 hours.

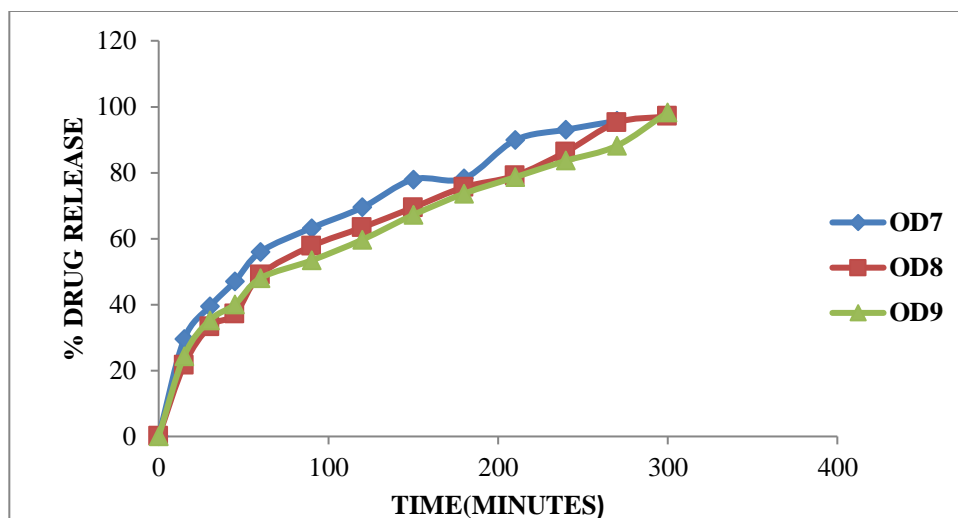


Figure No.12: Diffusion study of gel containing Ondansetron with HPMC15+ Carbopol-934 (OD7 to OD9)

The % drug release of OD7 to OD9 formulations depends on ratios of polymer in the Gel. The **HPMC15+ Carbopol-934** 1:1 ratio was unable to retard the drug release up to desired time. When the ratio of **HPMC15+ Carbopol-934** 1:3 was retard the drug up to desired time period i.e. 98.28% at 5 hours. In OD9 formulations, **HPMC15+ Carbopol-934** is 1:2 ratios it is more retard the drug release.

Hence based on Diffusion data of 9 formulations, OD9 formulation showed better release up to 5 hours. So OD9 formulation is optimized formulation.

Pharmacokinetics

Application of Release Rate Kinetics to drug diffusion Data

Data of *in vitro* release studies of formulations which were showing better drug release were fit into different equations to explain the release kinetics of Ondansetron release from Sustained tablets. The data was fitted into various kinetic models such as zero, first order kinetics; higuchi and korsmeyer peppas mechanisms and the results were shown in below table.

Table 8: Release kinetics data for optimized formulation (OD9)

CUMULATIVE(%) RELEASE Q	Time(M in)	ROOT (T)	LOG(%) RELEASE	LOG (T)	LOG (%) REMAIN	RELEASE RATE (CUMULATIVE % RELEASE/ t)	1/CUM% RELEASE	PEPPAS log Q/100	% Drug Remaining	Q01/3	Qt1/3	Q01/3- Qt1/3
0	0	0			2.000				100	4.642	4.642	0.000
24.41	15	3.873	1.388	1.176	1.878	1.627	0.0410	-0.612	75.59	4.642	4.228	0.413
35.19	30	5.477	1.546	1.477	1.812	1.173	0.0284	-0.454	64.81	4.642	4.017	0.625
40.1	45	6.708	1.603	1.653	1.777	0.891	0.0249	-0.397	59.9	4.642	3.913	0.729
48.02	60	7.746	1.681	1.778	1.716	0.800	0.0208	-0.319	51.98	4.642	3.732	0.910
53.36	90	9.487	1.727	1.954	1.669	0.593	0.0187	-0.273	46.64	4.642	3.600	1.042
59.67	120	10.954	1.776	2.079	1.606	0.497	0.0168	-0.224	40.33	4.642	3.429	1.212
67.18	150	12.247	1.827	2.176	1.516	0.448	0.0149	-0.173	32.82	4.642	3.202	1.440
73.65	180	13.416	1.867	2.255	1.421	0.409	0.0136	-0.133	26.35	4.642	2.976	1.666
78.61	210	14.491	1.895	2.322	1.330	0.374	0.0127	-0.105	21.39	4.642	2.776	1.866
83.62	240	15.492	1.922	2.380	1.214	0.348	0.0120	-0.078	16.38	4.642	2.540	2.102
88.15	270	16.432	1.945	2.431	1.074	0.326	0.0113	-0.055	11.85	4.642	2.280	2.362
98.28	300	17.321	1.992	2.477	0.236	0.328	0.0102	-0.008	1.72	4.642	1.198	3.443

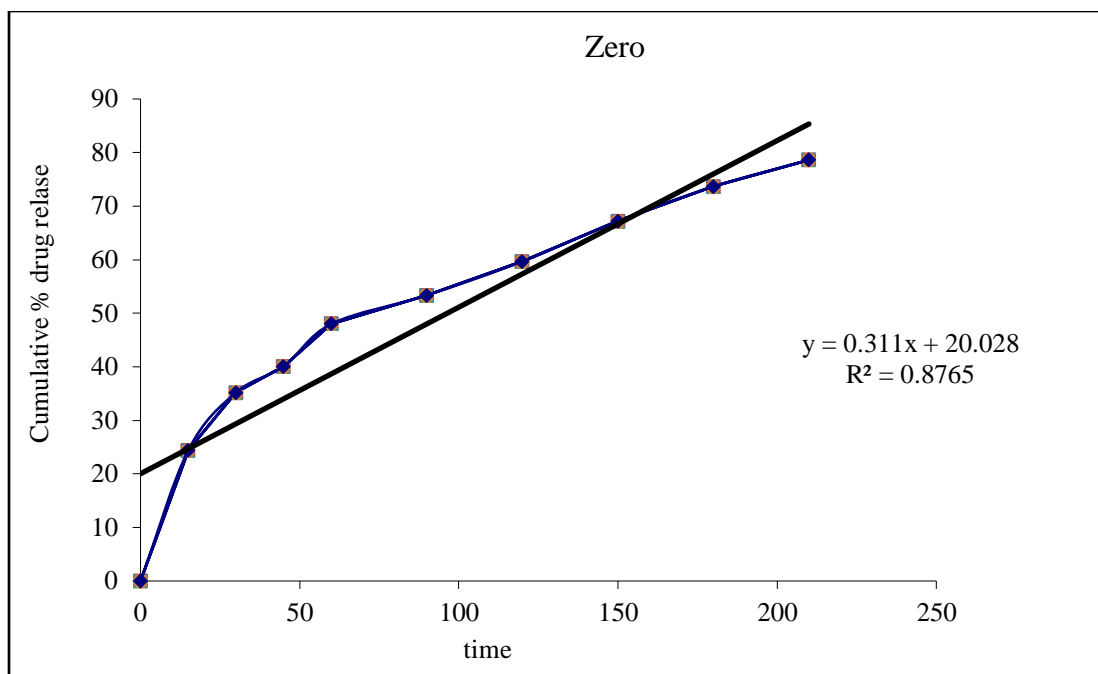


Figure No.13: Graph of zero order kinetics

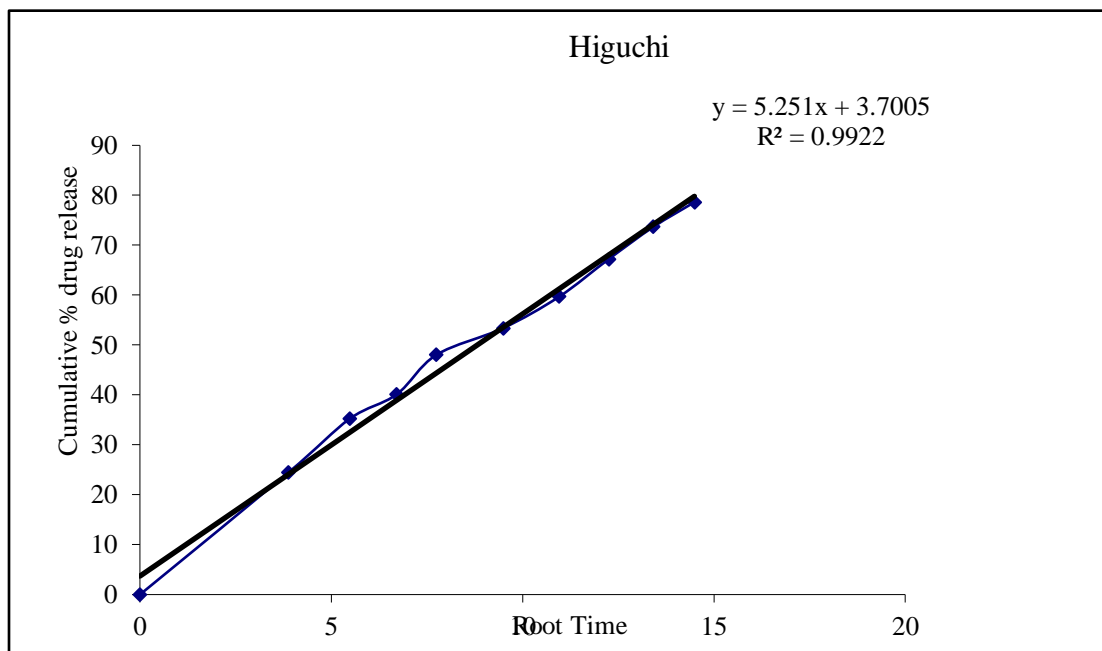


Figure No.14: Graph of higuchi release kinetics

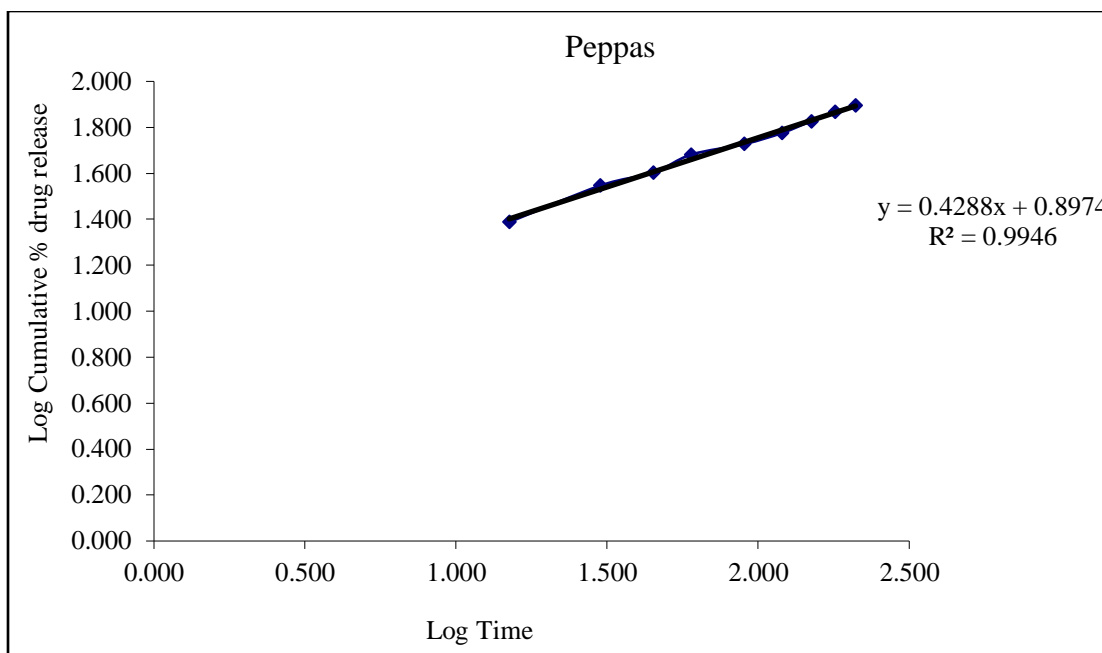


Figure No.15: Graph of peppas release kinetics

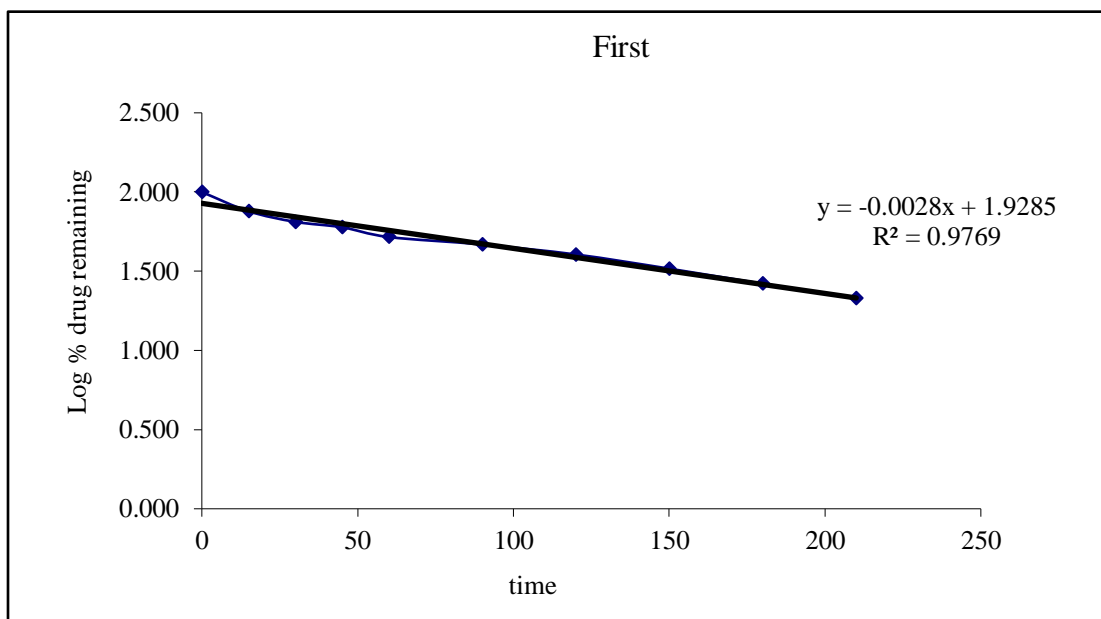


Figure No.16: Graph of first order release kinetics

Drug Release Kinetic Study

The release data analysis was carried out using the various kinetic models i.e. using cumulative % drug release vs. time (zero order kinetic model); log cumulative % drug remaining vs. time (first order kinetic model) and cumulative % drug release vs. square root of time (Higuchi model). The R^2 values are tabulated in table. All formulae showed best fitting to peppas release kinetics.

CONCLUSION:

The formulation and evaluation of ondansetron topical gel demonstrated that it is a viable alternative to traditional oral or intravenous administration for managing nausea and vomiting. The gel exhibited desirable properties including appropriate viscosity and drug release characteristics. The in vitro release studies confirmed a sustained release profile, which is essential for prolonged therapeutic effects. Additionally the gel showed good skin compatibility with minimal irritation highlighting its potential for

patient-friendly application. Overall, the successful development of this topical gel formulation could offer a more convenient and effective option for patients requiring ondansetron therapy.

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