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Formulation and Evaluation of Ramosetron HCl Matrix Tablet by Direct Compression

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ABSTRACT

Objective: For all the reasons therein, present work aimed at preparation and assessment of sustained release (SR) ramosetron HCl 200mg matrix tablets by Direct compression technique. **Method:** In order to have an appropriate profile of release that is not significantly affected by the restrained variations in hardness etc. of the tablets which are common due to process of production, in existing work ethyl cellulose (EC) and hydroxyl propyl methyl cellulose (HPMC) polymers was selected for Ramosetron HCl matrix tablet development. The relative percentages of drug:polymer, to control the release of drug up to the desired time were determined. Spectroscopy techniques based on UV and FTIR was used to study API and its behaviors with other components. Direct compression method was used to prepare tablet matrix. This method is economical and simplest in development of tablets. It is distinguished for being effective for substances hygro-scopic and temperature labile. The 6 preparations in the ratio of various percentages of polymer were prepared namely SR1-SR6. Pre and Post compression constraints assessed. Some characteristics, which include the variations in weight, in bulkiness, in stiffness and brittleness of each formulated tablets along with the drug percentage content were determined, after formulation. In-vitro study of release profile done in buffer of phosphate with pH 7.4. This was monitored for 12hrs. **Results:** Spectroscopic analysis did not reveal any level of chemical in-compatibility of any of the additives with drug API. The result indicates that all dosages falls in the required level. SR tablets was found to have physical and chemical attributes in appropriate range. **Conclusion:** Once a day Ramosetron HCl preparation is chosen to reduce the number of intakes and hence enhance concordance by patients. It is hypothesized that SR formulation of this drug is needed as it has half-life which is short biologically along with the drug clearing at very fast rate from the body. According to the dissolution profile, it can be concluded that higher polymer percent led to slower release of drug elongating duration of action.

Keywords: Ramosetron HCl, HPMC, ethyl cellulose (EC), Matrix Tablets, Direct Compression

1. INTRODUCTION

Traditionally, oral route for giving drugs was the most dominate in the market of pharmaceutical share which exist today as well. It has greater acceptance among patients due to ease of consumption. Also, sterility is not being an issue, and more especially, the flexibility allowed in the design of dosage forms. The oral route thus ranked as most preferred routs in drug administration [1].

SR drug systems of delivery have the objectives predominantly to maintain a constant drug concentration in Blood for extended period [2]. Being passive chemically, they have capacity to embed drug altering its release features. Devices that form matrix have amplified the underlying principle in suspending release of drug moiety [3]. Either polymers being hydrophilic or hydrophobic or both, are reported to used in matrix formation to regulate rate of drug release [4,5]. The matrix formulations can be processed using equipment's which are common, not very complicated. In present study, hydrophilic polymer was preferred for making matrix. This was so because it is believed to provide stable dosage to be produced using conventional processes for making tablets. Besides, it is feasible to formulate the product with solvents of inorganic type as organic types carry significant environmental hazards even in very scanty percentage in final dosages.

Now talking about the degradable biological polymers. These polymers are produced from natural renewable resources as raw materials. These have ease for both chemical synthesis i.e. from items of biological origin as well biogenetic synthesis using algae or other living forms. Among the biological materials from natural source, one should mention HPMC being highly bio-compatible. Being ether nonionic polymer it is also soluble in aqueous media and also resistance to enzymes. 3. 0 to 11. 0 range of pH has been reported to be stable for it. The groups hydroxyl type in cellulose moiety of this polymer are both methylated as well hydroxyl propylated at 2nd position. It is one of the most preferred polymer material in both pharmacy as well nourishment businesses. It is used for different purposes like to control or modulate the API release from dosage, for balancing texture as well the rheology of given spreading, also for emulsifying abilities and many more [6].

Another one considered in the present study was ethyl cellulose. It is thermally stable polymer type that is insoluble in aqueous medias. EC is an ether derivative with ethyl cellulose of the cellulose moiety. It is manufactured by the partial ethoxylation of certain groups of hydroxyl type found in moiety of cellulose. The temperature of transition from hard to viscous state is 130 °C about. While its melting temperature is 180 °C about, which are somewhat associated to the weight at molecular level of polymer. Attribute to its flexibility as well transparency, it is good for forming films over various dosages. Also, due to its appreciable miscibility with things of organic nature, widely used as adhesive, binder and also modifier of film rheology. As for, EC has preference for SR dosage preparations [7].

No patient on chemotherapy or therapy by radiation will lack nausea and vomiting episodes. For instance, it is evident that 70- 80 percent of victims on such therapy experience different degrees of vomiting or nausea [8]. Unfortunately, this worsens the life of these cases. This is also true and mostly experienced during the pregnancy periods. According to several guidelines (i.e. international or national) which have been designed to help avoid the suffering from these ailments. Among such efforts is the discovery of antagonist for 5HT3 receptors. These as a drug has gone a long-way in alleviating vomiting, nausea etc. for various victims [9].

Among these various approved antagonists, a benz-imidazole tetra-hydro derived i.e. Ramosetron hydrochloride is being preferred now a day. This medicine from group of antiemetic, has high-potency as well high selectivity for 5HT3 receptors. In addition to having capacity of binding being good, the rate of separation from respective receptors is pretty slow which earns it long-lasting impacts compared to erstwhile agents [10]. Hydrochloride salt of ramosetron is white powder being amorphous and hygroscopic. It possesses good solubility in aqueous as well alcohol media. Through blocking serotonin from interacting with its native 5-HT3 targets primarily localized on the terminals of vagal sensory nerves found in mucosa of gastro intestine tract, antiemetic effects of this salt appears. Compared to most of the approved antagonists for 5-HT3 receptor, ramosetron apparently is reported to have stronger antiemetic actions [11]. This research study is intended in the preparation of a sustained release dosage form of ramosetron hydrochloride that would combat nuisance of nausea and vomiting and make it more convenient for patients of any age to take as needed.

2. MATERIALS

The active therapeutic agent i.e. Ramosetron hydrochloride was purchased from Corel Pharma Chem unit at Ahmedabad in India. From Central Drug House at New Delhi in India, HPMC and ethyl cellulose (EC) were bought, locally named as CDR. Other ingredients i.e. Lactose and Talc was brought from Loba chem while Magnesium stearate from Moly Chem, both located at Mumbai (India). Any other solvent and reagents used in this study were obtained from Germany based Merck alliance in India. All the reagents and solvents were of analytical grade.

3. METHODS

3.1 Studies Prior to formulation

3.1.1 API Melting Point Determination

Melting temperature of the procured drug was determined by the method of capillary fusion along with associated melting point equipment from Amtech, India. The melting point value that was obtained was recorded and compared to that which was standard value according to literature [12].

3.1.2 Ultra Violet Spectrophotometric Evaluation

0.1% fresh solution of Ramosetron Hydrochloride as stock was prepared by accurately weighing about 100 mg of API and liquefying it in water distilled three times, before making up to the required volume in a 100 ml volumetric flask. Subsequently, 25 ml, 20 ml and 10 ml of the stock solution are pipetted individually into three respective 100 ml standard flasks and diluted to the respective concentrations. These working standard solutions are 250µg/ml, 200µg/ml and 100µg/ml [13].

3.1.3 Bulk Density Determination

The volume of packing of powder in the instrument was determined using the tap on a granular cylinder mechanism with a particular cut rotating cam. Fifty grams of powder measured to the required accuracy was placed on the cylinder using a funnel. The powder volume at beginning was recorded. Further, the sample was tapped using a tapping machine for 750 tappings, after which there was no further reduction in the volume with percentage of volume change remaining below 2%. The equation: Bulk density = M/ V(bulk); Where, M is Mass of API Powder and V(bulk) is the Bulk volume; was used. Enough taps were done taking care of variation in particle size due to abrasion [14].

3.1.4 Tapped Density Determination

With the help of apparatus for measuring tapped density, drug API with the excipient was placed into 250 ml graduated measuring cylinder. The markings on the graduated cylinder were read and then the cylinder was tapped one hundred times to bring the volume change to equilibrium. Three times the process was done. Mean of the obtained figures of the tapped volume were used using equation: tapped density = M/V(tap); Where, M is the Mass of the Powder and V(tap) is the Tapped volume [15].

3.1.5 Compressibility Index

The most straightforward way of associating a numerical value to a powder's propensity to experiencing free flow is by calculating the powder's % CI or % compressibility index. It is expressed as: % compressibility (CI) = [Tapped density – Bulk density/ Tapped density] x 100 [14].

3.1.6 Angle of repose

The angle of repose of blends was analyzed using the method of the funnel. The accurately weighed blend was taken in the funnel. The height of the funnel was changed as to enable the tip of the funnel to lightly touch the apex of that heap of the blend. After that the blend was let to flow from the funnel on the surface. Specifically, the density and the height of the heap made from the blend were determined. The angle of repose though defined earlier was calculated analytically through the formula [14].

Tan Ɵ= h/r

Where, "h" is the height of the heap and "r" is the radius of the heap of granules.

3.1.7 Drug Solubility Study

a) In Aqueous Solvent

For determining the solubility, saturation shake flask method was employed as per prepared protocol for Ramosetron hydrochloride in water. An appropriate amount of Ramosetron hydrochloride was dissolved in distilled water in an acetate buffer, the pH of which was adjusted to 5. 5, and thereafter immersion of the slurry was done centrifuged over 48 hrs at 37°C. The result was diluted before it was analyzed using a 270 nm spectrophotometer. It was also established that the measurement was taken in triplicate [16].

b) In Organic Solvent

The saturation shake flask method was applied for the determination of solubility of Ramosetron hydrochloride in ethanol. An appropriate amount of Ramosetron hydrochloride was dissolved in ethanol and centrifuged the solution at 37°C, 50 rpm for 48 hours. The obtained slurry was filtered and the content was measuring as well at 270 nm spectrophotometry, in three repetations [17].

3.1.8 Drug Excipient Compatibility Study by FTIR

To exclude the interaction effect between drugs and excipients, Infrared spectra of physical mixtures and the pure drug were compared [18]. For this, separate mixture of drug with each of the polymers and other additives was made. This was done by grinding them into fine powder by trituration. A blend of 50 mg Ramosetron hydrochloride with selected additive in 50 mg was made and filled into sterilized glass vial. Rubber closures were placed over the vials and sealed with aluminum lining. At 4 degrees Celsius the vials were kept, with relative humidity of 40 degrees' Celsius vs 75 percent for four weeks. This was done to check the interaction if any in short time at extreme temperature exposure. The color was noted, the flow, and if it was sticking to the gauze or not were also measured. Further, sample were analyzed using FTIR spectrophotometer (Labindia-3000 Plus).

3.2 Direct Compression Method for Tablet Preparation

The accurate quantity of drug Ramosetron hydrochloride, and all the excipients HPMC, Ethyl cellulose, Lactose, magnesium stearate and talc were mixed and sieved through 16 meshes. The mixture was added to the hopper of tableting machine. By using the direct compression, the tablets were prepared with the help of rotatory punching machine automatic with multi-station. Punch of 8 mm diameter was used for processing in this rotary tablet machine. The composition of each of 6 formulations is given in table 1.

Table 1 Composition of SR matrix tablet of Ramosetron hydrochloride

S. No.	**Ingredients**	**SR1**	**SR2**	**SR3**	**SR4**	**SR5**	**SR6**
1	Ramosetron hydrochloride	15	15	15	15	15	15
2	HPMC	65	75	85	-	-	-
4	Ethyl Cellulose	-	-	-	65	75	85
5	Lactose	100	90	80	100	90	80
6	Talc	10	10	10	10	10	10
7	Magnesium Stearate	5	5	5	5	5	5
Total Weight		200	200	200	200	200	200

3.3 Evaluation of Tablet

3.3.1 Description

5 tablets from each of the formulation were randomly selected and examined for colour, shape size [19].

3.3.2 Hardness

To study the hardness of the developed tablets, 6 tablets from each batch selected indiscriminately were subjected to hardness analysis. For this VinSyst Manual Monsanto Type 1 Hardness analyzer Model from Grover Enterprises, Delhi, India, was used. Average of three readings was used to find the kg/cm2 of the hardness of the material [20].

3.3.3 Thickness

Each batch of 20 tablets was seemingly chosen at random & the thickness of each obtained tablet was measured with a vernier caliper [21].

3.3.4 Weight variation

In the course of the experiment 20 tablets were randomly chosen from each formulation. The tablets were weighed individually to obtain the average weight of the tablets. Then the deviation from the averaged mass was computed which indicated the variation in weight [22].

3.3.5 Friability

The test was performed using Roche's Friabilator. After random selection of 10 tablets from each batch, they were accurately weighed. The weighed tablets placed in a plastic container within friabilator. It was revolved with an angular velocity of 25 rpm. Dropping of tablet each time it revolves, from a height of 6 inches was observed. Tablets collected and dusts over it were brushed off. These were then again weighed. A total of 100 rotations were performed [23].

3.3.6 Drug Content Uniformity

Uniformity in amount of drug in dosage form was assured when the extracted amount of 10 mcg of Ramosetron HCl was attained. For this, randomly 6 tablets, one from each formulation was crushed and mixed with 100 ml 6.8 pH phosphate-buffered solution. The drug concentration of the samples was determined by UV spectrophotometer at 270 nm. Three repetitions was performed for each samples [24].

3.3.7 Disintegration Time

By heating one tablet from each formulation in 900 ml triple distilled water at temperature of 37°C ± 0.5°C, the time required for disintegration of formulated SR tablets was determined. A USP disintegrating apparatus was used [19] All of the fragments of the broken tablet that went through the basket's Screening process were recorded in respective time as they went through it. The mean of 3 measurements was recorded to reduce variation [25].

3.3.8 In-Vitro Drug Release

Equipment used in the in-vitro dissolution test entails the use of dissolution apparatus of the USP24. The apparatus is type II and corresponds to the Paddle technique. In this the revolving speed of attached basket is of 100rpm. To conduct a dissolution test, the medicine is dissolved in the medium for a total of 10 hours. The dissolution medium used here was 750 ml of 0.1 N HCl with 1.2 pH solution. This was used for the first 2 hours keeping temperature of 37 ± 0. 5ºC. Further then the medium was replaced with 1000 ml phosphate buffer pH 6.8 solution. This was maintained for the remaining 8hrs of the study keeping the temperature constant. About 10 ml of sample was pipetted during sample being replaced with equal volume of fresh dissolution medium, done at specified time intervals (Ashok). The samples drawn were filtered through filter of 0.45-micron membrane. Concentration of drugs in each sample was assessed by 270 nm UV spectrometer. A standardized calibration curve of Ramosetron hydrochloride was created to work for the actual sample contents [26].

4. RESULT

4.1 Pre-formulation evaluation of API

The API procured was in powder form being weight to slightly brown in texture. The UV Spectrophotometric study performed in methanol was observed to have absorbance at 269±0.22 nm which is equivalent to the pharmacopoeial reported value of 270 nm. Also, the melting Point of API Ramosetron hydrochloride melting point was found 245 ± 0.05° C, which is within the pharmacopoeial value. Results enlisted in table 2.

Table 2: Identification tests for drugs

S. No.	Parameters	Experimental Values	Literature Value
1	Melting point	245±0.05°C	244-246°C (I.P. 2009)
2	UV Spectrophotometric in Methanol	269±0.22 nm	270 nm (I.P. 2007)

Values are expressed in Mean± SD

4.2 Drug Solubility Study

4.2.1 Aqueous Solubility

The water solubility test of Ramosetron hydrochloride was found 62.79 mg/ml drug dissolve in water, in accordance with the reported values. It means the drug is soluble in aqueous medium.

4.2.2 Organic Solubility

The solubility of Ramosetron hydrochloride in ethanol was found to be 1.051 mg/ml. Indicating the drug is considerably soluble in given organic solvent.

4.3 Drug Excipient Compatibility Study by FTIR

The FTIR spectrum is by standard used to evaluate the compatibility of ramosetron hydrochloride (API) with drug excipients. Different peaks of pure drug to that in various mixtures reveal significant compatibility lacking any kind of molecular interactions. The result reveals drug and formulation components are sufficiently compatible. The graph is shown below in Fig 1 (a) to (f).

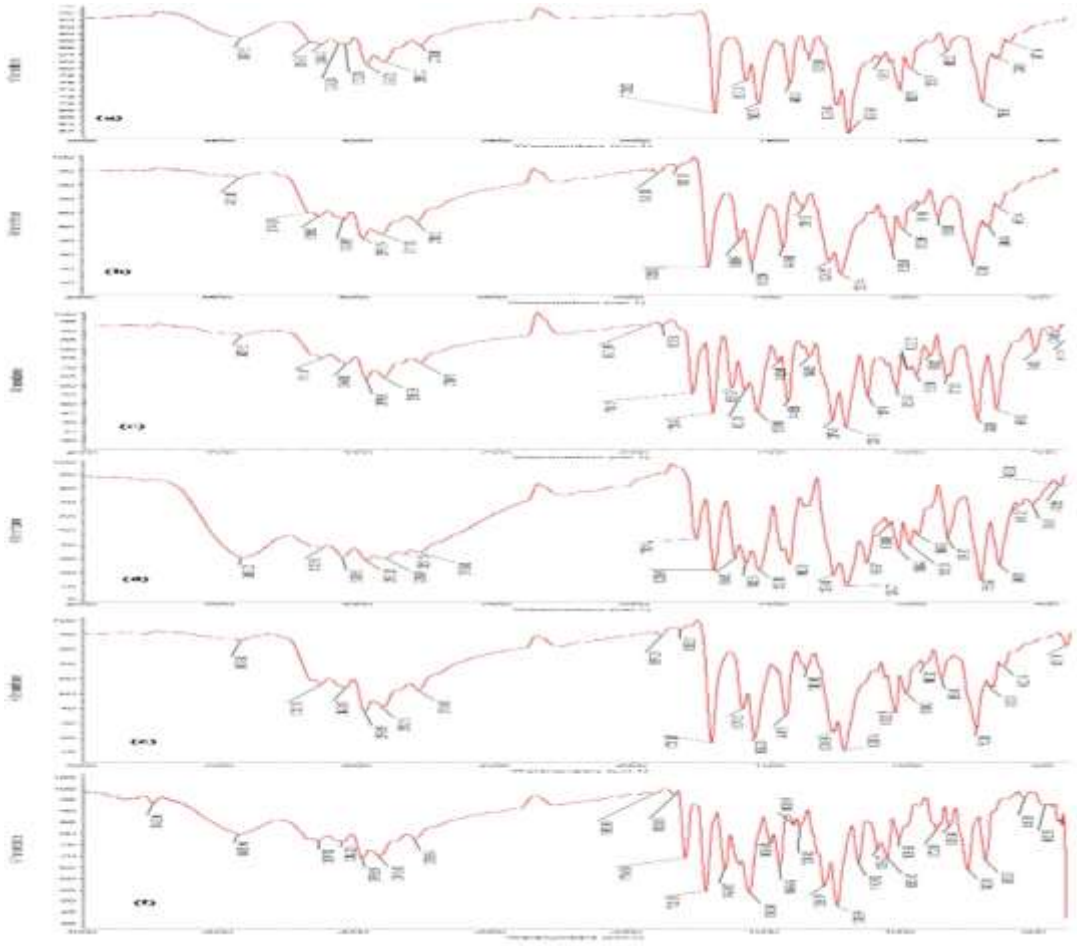

Fig 1 (a) FTIR of Ramosetron HCL (API); (b) FTIR of Ramosetron HCL + HPMC; (c) FTIR of Ramosetron HCL + EC; (d) FTIR of Ramosetron HCL + Lactose; (e) FTIR of Ramosetron HCL + Talc; (f) FTIR of Ramosetron HCL + Magnesium Stearate

4.4 Evaluation of Tablet

4.4.1 Pre-compression parameters - Angle of Repose

The angle of repose for each formulation was calculated using the fixed funnel method, and the results showed values ranging from 34.78±0.15 to 35.97±0.18, indicating that the granules had adequate flow characteristics for compression. Results enlisted in table 3.

Table 3: Angle of Repose of the Formulation

Formulation	**SR1**	**SR2**	**SR3**	**SR4**	**SR5**
Angle of Repose	35.85±0.24	34.78±0.15	35.45±0.39	35.97±0.18	34.78±0.24
Flow	Fair	Good	Good	Fair	Good

Values are expressed in Mean± SD

4.4.2 Bulk and Tapped Density and Carr's Compressibility Ratio

For all the compositions', the bulk density ranged between 0.461±0.28 g/ml to 0.468±0.23 g/ml. The tapped density that varied from 0.339±0.19 g/ml to 0.350±0.32 g/ml while the compressibility ratios was observed in the range of 24.20±0.26 to 24.44±0.28. The results are compiled in table 4.

Table 4: Pre-Compression Parameters of the Formulations

Formulations	**Bulk Density (g/ml)**	**Tapped Density (g/ml)**	**Carr's Index (%)**
SR1	0.462±0.20	0.341±0.36	24.20±0.26
SR2	0.461±0.28	0.339±0.19	24.34±0.37
SR3	0.463±0.32	0.342±0.24	24.39±0.33
SR4	0.465±0.25	0.350±0.32	24.44±0.28
SR5	0.468±0.23	0.337±0.21	24.42±0.32

Values are expressed in Mean± SD

4.4.3 Post-Compression Parameters - Determination of Hardness

The hardness tablets from each preparation were within the range of 5.02±0.25 kg/cm^2 to 7.69±0.43 kg/cm^2, demonstrating the formulations' strong ability to become mechanically stable throughout the transit. Results enlisted in table 5 under.

4.4.4 Weight Variation

Following the procedure outlined in the pharmacopeia (Indian Pharmacopoeia 1996), prepared tablets were checked for weight variation. All of the formulations reportedly passed the weight variation test because the weight variation ranged from 403±0.27 to 412±0.35. Results enlisted in table 5 under.

4.4.5 Thickness

The thickness of 20 tablets from different batches were found to range between 3.92±0.30 to 4.07±0.23 mm. Results enlisted in table 5 under.

4.4.6 Friability

The earlier-discussed procedure was used to conduct the test for friability. According to the restrictions specified in Pharmacopoeia (Indian Pharmacopoeia 1996), the results were examined and categorized. The compendia specification for a tablet's mechanical characteristic called "friability" should be less than or equal to 1%. It is a kind of parameter indicating surface deformation. The claim was verified to be accurate for all the formulations that had been prepared. The values fell within the range of 0.18±0.08 to 0.28±0.21, which indicates that the formulations are well stable mechanically. Results enlisted in table 5 under.

4.4.7 Disintegration Time

All five formulations (SR1, SR2, SR3, SR4, and SR5) had disintegration times that ranged from 7.31±0.42 min to 8.66±0.21min, indicated within acceptable range. Results enlisted in table 5 under.

4.4.8. Drug Content Uniformity

The uniformity of the content of Ramosetron hydrochloride tablets was assessed using UV- visible spectroscopy was observed between the range of 83.79±0.18 to 95.59±0.25. The outcomes from the tablets' formulation were within acceptable limits. Results enlisted in table 5 under.

Table 5: Comparative Findings of Different Evaluation Criteria for Prepared Tablets

Code	Weight variation	Hardness kg/cm2	Thickness (mm)	Friability (%)	Disintegration time (min)	% Drug content
SR1	403±0.27	6.84±0.20	3.92±0.30	0.22±0.21	7.31±0.42	83.79±0.18
SR2	406±0.21	5.03±0.34	4.05±0.21	0.26±0.13	8.66±0.21	95.59±0.25
SR3	408±0.31	5.02±0.25	4.02±0.13	0.28±0.21	7.98±0.38	93.28±0.28
SR4	412±0.35	7.69±0.43	4.07±0.23	0.23±0.10	8.18±0.18	89.79±0.23
SR5	408±0.28	6.08±0.64	4.06±0.28	0.18±0.08	8.34±0.28	91.19±0.16

Values are expressed in Mean± SD

4.5 Quantitative Estimation of the Drug

4.5.1 Calibration Curve of Ramosetron Hydrochloride

Subsequently Ramosetron Hydrochloride was analyzed by UV Spectrophotometric at 270 nm in pH 7.4 phosphate buffer in presence of methanol. The standard curve for ramosetron hydrochloride was observed to be almost straight line from the origin. This depicts Beer Lambert's law. The Ramosetron Hydrochloride standard calibration curve is shown in the following figure 2 and tabulated in table 6 under.

Table 6: Calibration Curve of Ramosetron Hydrochloride by using UV Spectroscopy

Sample	Concentration	Absorbance value
1	0 µg/ml	0.145
2	2 µg/ml	0.278
3	4 µg/ml	0.456
4	6 µg/ml	0.579
5	8 µg/ml	0.751
6	10 µg/ml	0.879

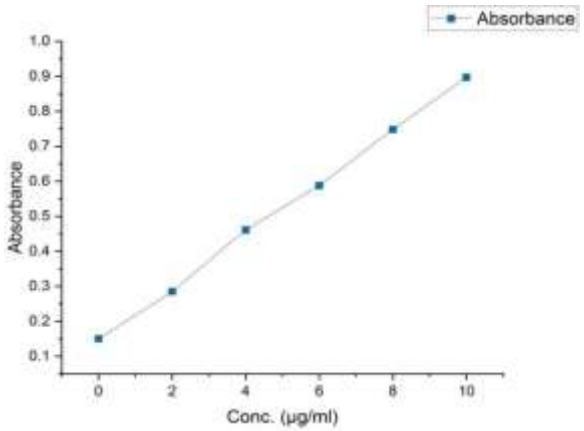

Figure 2: Calibration Curve of Ramosetron Hydrochloride

4.5.2 In-vitro drug release and kinetic profile

Through applying of the zero-order, and first order models; the in-vitro drug release profile of matrix tablet formulation of Ramosetrone hydrochloride was compared statistically. In order to distinguish the kinetics models statistically, the mechanism of release profiling was elaborated for the drug releasing system. Thus, the high regression coefficient value was considered to provide great benefits to the initialization and acceptance of kinetics commands. The results enlisted in table 7 under and illustrated in figure 3.

Table 7: *In-vitro* drug release profile of different formulations

Time (hr)	**% Drug Release± S.D.**				
	SR1	**SR2**	**SR3**	**SR4**	**SR5**
1	10.48±0.26	5.62±0.83	9.32±0.42	6.92±0.38	6.71±0.38
2	14.42±0.82	11.37±0.25	15.68±0.63	10.92±0.82	9.30±0.68
3	21.35±0.97	16.46±0.42	22.86±0.54	17.23±0.77	16.83±0.66
4	32.85±0.35	27.35±0.69	31.72±0.38	24.35±0.98	25.66±0.29
5	43.48±0.23	36.90±0.88	41.72±0.33	31.33±0.57	32.95±0.14
6	52.24±0.26	44.74±0.69	50.93±0.74	40.82±0.65	39.83±0.56
7	61.36±0.23	53.43±0.33	59.98±0.42	47.83±0.53	46.31±0.45
8	70.75±0.76	59.76±0.85	68.68±0.44	55.82±0.56	54.34±0.33
9	78.28±0.23	66.88±0.29	79.41±0.33	64.65±0.65	63.36±0.23
10	85.64±0.48	71.65±0.53	84.84±0.85	72.71±0.31	70.74±0.38
11	89.24±0.39	76.46±0.48	89.25±0.65	78.64±0.46	77.33±0.45
12	93.66±0.52	78.33±0.65	94.14±0.28	83.88±0.74	85.43±0.36

Values are expressed in Mean± SD

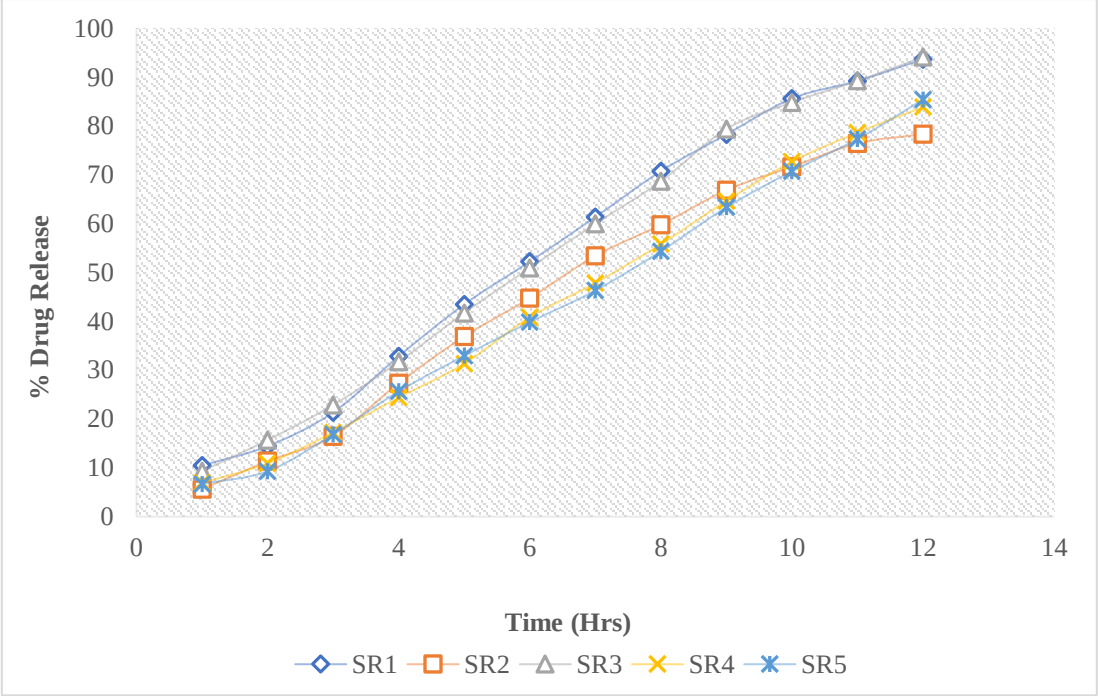

Figure 3: *In-Vitro* Drug Release of Ramosetron Hydrochloride SR formulations

5. DISCUSSION

In the case of granules of different formulation, the values for the bulk density, tapped density and angle of repose were determined. The bulking and tapped density results obtained for all the samples ranged from 0. 461±0. 28 g/ml to 0. 468±0. 23 g/ml and 0. 339±0. 19 g/ml to 0. 350±0. 32 g/ml, subsequently. For that matter, it was noted that angle of repose ranged from 34. 78±0. 15 to 35. 97±0. 18. The thickness of the tablets ranged as low as 3. 92±0. 30 to 4. 07±0. 23 mm. It was also found for all the batches of tablets that hardness and % friability were within the range of 5. 02±0. 25 kg/cm2 to 7. 69±0. 43 kg/cm2 and 0. 18±0. 08 to 0. 28±0. 21 subsequently. It was further realized that in completely different batches of the tablets, content of the drug was unaltered and ranged from 83. 79±0. 18 to 95. 59±0. 25. Referring to thickness, hardness and drug content as well as friability values all the prepared tablets belonged to outstanding quality in terms of the respective batch. All the tablets met standards of weight change as well friability within pharmacopeial regulation. It was also established that as drug-polymer ratio rises it causes decline in drug discharge from tablets. The Dissolution characteristics of the drugs in SR1 and SR3 (93. 66±0. 52 & 94. 14±0. 28) could be regarded as good. Thus, it was observed that drug release rate is a function of both the ratio of the drug to the polymer and the composition of the matrix.

Hydrophilic matrix concern compositions for Ramosetron hydrochloride sustained release tablets have included HPMC and ethyl cellulose. Both types of polymer were used, and when in contact with an aqueous medium, they made a rather dense gel which may help in the sustained release of a water soluble drug.

6. CONCLUSION

It was found that the release profile of the developed tablets was almost in the close proximity to engage the sustained release requirement that is supposed to be expected for Ramosetron hydrochloride. The release profile of formulations particularly SR1 and SR3 resembled the tested SR tablets that were taken from the market. The stability tests performed at 45ºC with 75% relative humidity for 30 days for every batch were non-influential on the drug composition and the rate of dissolution. Thus, the results of the current investigation enable to assume that Ramosetron hydrochloride was released with a specific rate over 12 hours' duration. The findings also show that all formulations give a better method for the controlled release of ramosetron hydrochloride once a daily dose.

7. ACKNOWLEDGEMENT

All the authors of present research work have contributed equally.

8. FUNDING

None

9. CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

9.1 ABBREVIATIONS

HCl	Hydrochloride
5-HT3	5-Hydroxytryptamine Type 3
HPMC	Hydroxyl propyl methyl cellulose
EC	Ethyl cellulose
CI	Compressibility Index
FTIR	Fourier-transform infrared spectroscopy USP United States Pharmacopeia
U. V.	Ultraviolet-visible spectroscopy
I. P.	Indian pharmacopoeia
SD	Standard deviation
API	Active pharmaceutical ingredient
SR	Sustained release
Q. S.	Quantity sufficient
Std.	Standard
PBS	Phosphate buffered saline

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