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Formulation And Development and Evaluation of Microencapsulated Suspension of Ofloxacin

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Abstract

The present work is to formulation and evaluation of Ofloxacin of microencapsulated suspension by using solvent evaporation method. The Preparation contains six formulations of suspensions with 2 different polymers with different concentrations as Ofloxacin resinate + HPMC, Ofloxacin resinate + Carbopol 934. The prepared batches of Ofloxacin microencapsulated suspension were evaluated for the pH, viscosity, sedimentation volume; density, drug content and antibacterial activity of all the six formulations were performed. Formulations F-3, F-6 gave better sustained release and antibacterial activity. Comparative study of F-3, F-6 with marketed product reveal the F-3 is best fitted formulation for preparation of microencapsulated suspension.

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Introduction

Development of novel drug delivery system has been one of the thrust areas of pharmaceutical research. Sustained release dosage forms were designed to release a drug at a predetermined rate by maintaining a constant drug level for specific period of time with minimum side effects. Over the Past 30 years, as the expense and complications involved in marketing new drug entities have increased, with concomitant recognition of the therapeutic advantages of Sustained drug delivery, greater attention is being paid on development of oral sustained release drug delivery systems [1].

Micro-encapsulation [2-3]

Is also regarded as a more complete technology to produce complex dissolution profiles. It is the process by which individual particles or droplets of solid or liquid material (the core) are surrounded or coated with a continuous film of polymeric material (the shell) to produce capsules in the micrometer to millimetre range, known as microcapsules. Among all the above techniques of microencapsulation, Present research work follows Solvent evaporation technique.

Solvent Evaporation Technique [4]

It is the most extensively used method of microencapsulation for controlled release of drugs. In the case in which the core material is dispersed in the polymer solution, polymer shrinks around the core. In the case in which core material is dissolved in the coating polymer solution, a matrix - type microcapsule is formed. The core materials may be either, water - soluble or water - insoluble materials. A variety of film - forming polymers can be used as coatings.

Ofloxacin 5 is chemically as (*RS*)-7-fluoro-2-methyl-6-(4-methylpiperazin-1-yl) 10-oxo-4-oxa-1 azatricyclo[7.3.1.0]trideca-5(13),6,8,11-tetraene-11-carboxylic acid, acts on DNA gyrase and toposiomerase IV, enzymes which, like human topoisomerase, prevents the excessive supercoiling of DNA during replication or transcription. By inhibiting their function, the drug thereby inhibits normal cell division.its chemical structure in fugure1

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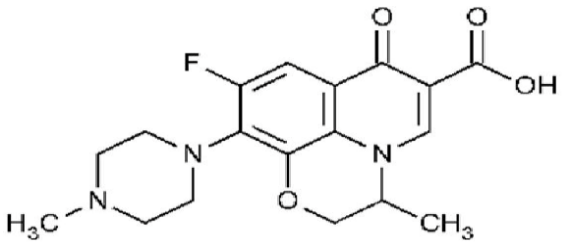

Figure1: chemical structure of ofloxacin

Experimental Work [6-10]

Materials and Methods

Ofloxacin purchased from Bridge pharma pvt ltd, Hyderabad, Indion resin 204 from Hi media labs . Mumbai. HPMC , Carbopol 934 from Qualigenes fine chemicals. Sucrose, Pluronic F 68 from Karnataka Fine Chem. Bangalore. Xanthan gum, Sorbitol solution, , Soya lecithin , Propyl paraben sodium , Methyl paraben sodium Glycerin from Bridge pharma pvt ltd, Hyderabad.

Procedure

1.Preparation Of Drug –Resin Complex (Resinate)

Resinates were prepared by batch process. An accurately weighed amount of drug (100 mg) was dissolved in 100 ml of distilled water. Then ion exchange resin (100 mg) was added and stirred on a magnetic stirrer. Resinate thus formed was filtered and washed with copious amount of deionised water to remove any uncomplexed drug. It was then dried at 50°C and the drug content was determined spectrophotometrically at 293.8 nm.

2.Preparation Of Suspension Using Resinates

A. Preparation of Bulk A

In a beaker, 6 ml water was heated up to 80° C. Sucrose (10 gm) was added under continuous stirring. The temperature was monitored in such a way so that it should not fall below 70° C, till the sucrose was completely dissolved. The prepared syrup was cooled properly at room temperature and kept overnight. Syrup was filtered using 120 mesh nylon cloth.

B. Preparation of Bulk B

Five millilitre of Ultra pure water was taken in a beaker to which 1.8 ml of sorbitol solution and 0.2 ml glycerine were added. The mixture was stirred properly. To this solution, pluronic F 68 (5%), soya lecithin (1%) and HPMC / C934 (5%) in w/w of drug were added with continuous stirring.

C. Preparation of Mucoadhesive Suspension and Ultrasonication

Five millilitre of water was taken in another beaker to which 200 mg of Ofloxacin – indion 204 complex (resonates) was added. To the resinate suspension, the bulk B and bulk A were added with continuous stirring. Xanthan gum is used as suspending agent. Methyl paraben sodium (0.015%w/v) and Propyl paraben sodium (0.08%w/v) were added as preservatives. The volume was made up to 25 ml by Ultra pure water. The pH was adjusted to 7.2. Homogenization was carried out for at least 20 min by ULTRASONIC HOMOZENIZER LABSONICRM, having operating frequency 30 KHZ and line voltage 230 V/50 HZ, using the probe made-up of Titanium of diameter 7 mm and length 80 mm. The setting knob "cycle" was adjusted to 0.8, indicating sound was emitted for 0.8 s and paused for 0.2 s. In this manner, we could expose our sample with 100% amplitude, while reducing the heating effect to 80%. This LABSONICRM generates longitudinal mechanical vibrations with a frequency of 30,000 oscillations / s (30 KHZ). The probes bolted to the sound transducer were made of high-strength Titanium alloys, built as λ /2 oscillators. It amplified the vertical oscillation, and transferred the ultrasonic energy via its front surface with extremely high power density into the sample that was to be subjected to ultrasonic waves. In our study, stress applied was sound wave and in addition, mild rise in temperature of the sample occurred during ultrasonication which helped in the homogenization of the suspension. The sample was then divided into two parts –one part was for FTIR analysis and the other part was used for Raman spectroscopy.

Table No – 1: FORMULATION OF ICROENCAPSULATED SUSPENSION OF OFLOXACIN [11-12]

Ingredients	Quantity of Ingredients (mg)					
	F-1	F-2	F-3	F-4	F-5	F-6
Ofloxacin-Indion204 (1:16)(resonates)	200	200	200	200	200	200
Carbopol 934(5%)	20	25	30	---	---	---
HPMC	---	---	---	20	25	30
Sucrose	15	15	15	15	15	15
Xanthan gum (%w/v)	0.6	0.6	0.6	0.6	0.6	0.6
Sorbitol sol.(70%)(ml)	1.8	1.8	1.8	1.8	1.8	1.8
Glycerin (ml)	0.2	0.2	0.2	0.2	0.2	0.2
Pluronic F68 (5%)	5	5	5	5	5	5
Soyalecithin (1%)	1	1	1	1	1	1
Peppermintoil, sunset yellow(ml)	0.2	0.2	0.2	0.2	0.2	0.2
Methylparaben & propyl paraben	0.02	0.02	0.02	0.02	0.02	0.02

Evaluation Of Ofloxacin-Indion 204 Resin Complex [14]

The drug loading on to resin was optimized for various parameters such as mixing time, activation , effect of pH, mode of mixing, ratio of drug: resin and effect of temperature.

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Effect of Drug: Resin ratio

The Indion-204 which showed highest amount of drug loading for ratio 1:1.5 was optimized for various drug: resin ratios. In each case, 100 mg of ofloxacin was stirred with varying amount of resin in deionised water using magnetic stirrer at 500 rpm. The amount of drug loaded at 60 mins. was determined indirectly by estimating the amount remaining to be loaded in solution spectrophotometrically at 293.8 nm [20].

Effect of pH on Drug Loading

The study was carried out at five pH values 1-7. The pH was adjusted to desired value using 0.1N HCl. Solution of 100 mg ofloxacin drug was stirred with 150mg of resin using magnetic stirrer at 500 rpm. The amount of drug loaded at 60 mins. was determined indirectly by estimating the amount remaining to be loaded in solution spectrophotometrically at 293.8 nm.

Effect of Temperature on Drug Loading

The study was carried out at four temperature conditions 30°C, 40°C, 60°C and 80°C. In each case, 100 mg of ofloxacin was stirred with 150 mg of resin in deionised water using magnetic stirrer at 500 rpm. The amount of drug loaded at 60 mins. was determined indirectly by estimating the amount remaining to be loaded in solution spectrophotometrically at 293.8 nm.

Effect of Drug concentration on Drug Loading

The study was carried out at three different concentrations 0.5 mg/ml, 1 mg/ml, 1.5 mg/ml, 1.7 mg/ml, 2 mg/ml. In each case, solution equivalent to 100 mg drug was stirred with 150 mg resin in deionised water using magnetic stirrer at 500 rpm. The amount of drug loaded at 60 mins. was determined indirectly by estimating the amount remaining to be loaded in solution spectrophotometrically at 293.8 nm.

Studies on Drug – Complexes

Drug release from DRC

Drug release from DRC was determined using United States Pharmacopoeia (USP) type II dissolution apparatus. DRC equivalent to 100 mg of drug of resinate was weighed accurately and added to 900 ml of 0.1 N hydrochloric acid and maintained at 37°C. Drug release was performed at 50 rpm for 120 min. Aliquots of the medium were withdrawn at regular intervals, filtered and the absorbance determined on spectrophotometer. From absorbance values, percent drug dissolved at various time intervals was determined.

Panel evaluation of taste

Panel of 9 members using sensory evaluation method determined the threshold bitterness value. Taste evaluation in volunteers confirmed that the taste of drug was masked by complexing with Indion 204 resin. The majority of the volunteers found the drug resin complex to be tasteless and agreeable

In vitro evaluation of Drug Content at pH 6.8

Drug release from the DRC was also performed in 10 ml of pH 6.8 solution by adding drug complex equivalent to 10 mg of Ofloxacin to a test tube. The mixtures were filtered after shaking for 60 s. The filtrates were assayed for drug. Drug resinates are insoluble hence, even resinate of bitter drugs have virtually no taste. With the correct selection of ion exchange resin, the drug is not released in the mouth so that the patient does not taste the drug when it is swallowed.

Differential Scanning Calorimetery (DSC) studies

A differential scanning calorimeter was used to analyze the thermal behavior of Ofloxacin and drug: resin complex of Ofloxacin: Indion-204. Indium standard was used to calibrate the DSC temperature. Nitrogen was purged at 50 ml/min and 100 ml/min through cooling unit. The thermal behavior of hermetically sealed samples (5-10 mg) was heated at 20°C/min.

Evaluation Of Formulation [15-18]

The formulation of solid drug: resin complex was evaluated for pH, viscosity, sedimentation volume, density and drug content. The rheological properties of all the formulation like viscosity, type of flow system, shears thinning index (ST index) and thixotropic index (Thix index) were determined by Brook Field viscometer (cone and plate) model.

Sensory Evaluation Of Formulation: The sample of each formulation subjected to sensory evaluation by a panel of nine members using time intensity method. 10 ml of each formulation held in mouth for about 10 seconds. Bitterness was recorded instantly and then after 20, 30, 40, 50 and 60 seconds. The evaluation was performed by classifying bitter taste into five levels, level 0: no bitter taste is sensed, 1: acceptable bitterness, 2: slightly bitter, 3: moderately bitter, 4: strongly bitterness. Descriptive statistics mean and standard deviation were calculated for all variables. Paired t test was applied using INSTAT software. Value $p< 0.05$ has been considered as statistically significant level.

Drug entrapment efficiency

Weighed quantity of microspheres were crushed and suspended in distilled water for 24 h to extract the drug from microspheres. The filtrate was then analyzed at 244.4 nm using UV–Vis spectrophotometer (JASCO V630, Japan) for drug content. The encapsulation efficiency was calculated using following equation:

Encapsulation efficiency = (Drug entrapped/Theoretical drug content)×100

Determination of sedimentation volume

Each suspension (50 ml) was stored in a 50 ml measuring cylinder for 4 days at 350C. Observations were made every 24 hr for 4 days. The sedimentation volume[22], F (%), was then calculated using the following equation.

$$F = 100\ Vu/V$$

Measurement of viscosity using brookfield viscometer

The viscosity (centipoise) of the sample was determined at 250C using Brookfield Synchro-electric viscometer; model LVF (Brookfield Laboratories, Massachusetts) at 100 RPM (spindle #4). All determinations were made in at least triplicate and the results obtained are expressed as the

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mean values. Viscosity of suspending agent η1 = η2 X (ρ1t1 / ρ2t2)

Determination of flow rate

The time required for each suspension sample to flow through a 10 ml pipette was determined and the apparent viscosity (ηα in mls-1) was calculated using the equation:

$$\text{Flow rate } \eta\alpha = \frac{\text{Volume of pipette (ml)}}{\text{Flow time (s)}} \quad (4)$$

Drug leaching in to the suspension

The amount of drug leaching in to the vehicle after the storage of suspension at room temperature for one month was determined by filtering the suspension and measuring the absorbance at 245nm, using a suspension prepare without microcapsule as a blank. The drugleached in the vehicle was calculated using the calibration curve

Data Analysis (Curve Fitting Analysis)

To analyze the mechanism of the drug release rate kinetics of the dosage form, the data obtained were graphed as:

1) Cumulative percentage drug released Vs Time (In-Vitro drug release plots)
2) Cumulative percentage drug released Vs Square root of time (Higuchi's plots)
3) Log cumulative percentage drug remaining Vs Time (First order plots)
4) Log percentage drug released Vs Log time (Peppas plots)

Results and discussion

Ofloxacin was subjected to the following evaluation tests and has passed all the tests.

Table -2 : PHYSICAL CHARACTERISATION OF OFLOXACIN

S.No	Test	Limits As Per Monograph	Observation
1.	DESCRIPTION	Off white to yellow crystals	Complies with U.S.P.
2.	SOLUBILITY	Slightly soluble in water, alcohol,dichloromethane, and methyl alcohol; sparingly soluble in chloroform.	Complies with U.S.P.
3.	MELTING POINT	270 - 275°C	272-275
4.	IDENTIFICATION	UV absorption spectroscopy	Complies with U.S.P.
5	ASSAY	98.0 – 101.0%	99.79%

Tabl 3: Linearity Table Of Ofloxacin In 0.1n Hcl Solution.

s.no	Concentration (µg/ml)	Absorbance
1	2	0.252
2	4	0.482
3	6	0.741
4	8	0.947
5	10	1.172
6	12	1.419
7	14	1.670
8	16	1.952
9	18	2.165
10	20	2.429

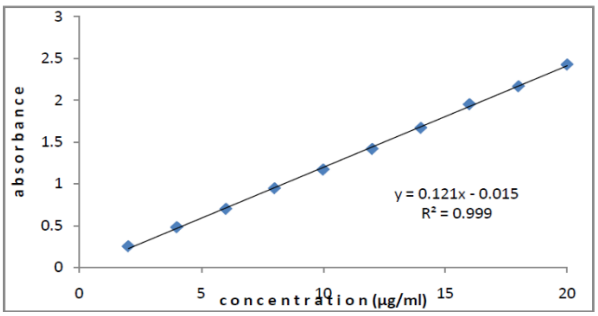

FIG 2:Calibration Curve Of Ofloxacin At 293nm

Evaluation Of Ofloxacin-Indion 204 Resin Complex

Ofloxacin was loaded on ion exchange resin by batch process. Complexation is essentially a process of diffusion of ions between the resin and surrounding drug solution. As reaction is equilibrium phenomenon, maximum efficacy is best achieved in batch process. The equilibrium ion exchange in solution occurs stoichiometrically[33]and hence is affected by stirring time. **Table** Shows Percent drug complexation is more with Indion-204 and hence Indion-204 is selected for further study. The percentage drug loading (wt/wt) with a stirring time of 5, 15, 30, 60, 120 minutes and 24 Hrs was found to be 71.93± 1.04%, 94.32± 1.52%, 92.51± 2.27 % and 94.18±1.92%, 92.48±2.28%, 93.89±2.11% respectively. Hence, 60 minutes mixing time was optimized.

Table 3 : Evaluation Of % Drug Complexation

S.No	Time	% Drug Complexation
1	5	71.93±1.04
2	15	94.32±1.52
3	30	92.51±2.27
4	60	94.18±1.92
5	120	92.48±2.28
6	240	91.47±2.27
7	24hrs	93.89±2.11

Highest drug binding on resin was achieved when activated with 1N HCl. The percentage drug loading with inactivated resin, treated with acid and alkali, was found to be 41.73 ± 0.45 %, 52.34±0.37%wt/wt and 48.21% ±

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0.12%wt/wt, respectively. After activation with acid treatment, the exchangeable ion on the resin is H+.Relative selectivity of H+ is least than other ionic form and therefore it increases percent complexation. Therefore acid activated resin is used for preparation of complex.

Maximum drug loading on the resin occurs at pH 4; a maximum of 95.16 % ± 4.49 for 1:1.5 of drug with indion 204. As pH increases above 4 percentage of drug loading decreases. This may be due to fact that the fraction of ofloxacin protonation decreases as the pH increases and reduces the interaction with the resin . The pHof the solution affects both solubility and the degree of ionization of drug and resin. The results can be attributed to the fact that cationic drug is ionized at lower pH value and hence demonstrate high binding capacity while at higher pH protonated fraction of cationic drug decreases and interaction with resin also decreases.

Table 4 : Evaluation Of Drug Loading

Ph	Drug Loading (%Wt/Wt)	Drug Loading After Shaking(%Wt/Wt)
3	52.48±2.13	50.79±1.26
3.5	58.93±0.15	52.38±0.38
4	60.39±1.39	56.93±1.36
4.5	59.57±2.18	56.42±1.78
5	58.15±4.43	54.32±3.41
5.5	57.13±1.85	53.27±0.87
6	56.85±0.57	52.13±0.15

Hence, ofloxacin as a cationic drug will have maximum solubility and complete ionization in this range. Complexation was found to be optimum in case of stirring, a maximum of 94.33±0.58% for 1:1.5 of drug with indion 204 and in case of shaking 92.23±0.82% of drug with indion 204. This finding may indicate the significant involvement of van der waals forces taking place along with drug exchange during complexation. As already known equilibration time for complex formation is longer, but some kind of energy is required for complexation processes which can be supplied in the form of stirring and shaking.

Energy supplied by all the modes may vary and hence there is significant effect of modes of mixing on percent drug complexation. The drug-loading efficiency for a drug-resin ratio 1:1, 1:1.5 and 1:2 of batch process was 84.01±2.37 94.33±2.61% wt/wt, 97.212± 1.7 %w/w for indion 204.

Drug – resin ratio	Drug loading efficiency (%wt/wt)
1:1	84.01±2.37
1:1.5	94.33±2.61
1:2	97.212±1.7

It is due to the fact that, increase in the amount of resin increases the amount of drug adsorbed from the solution. A 13% wt/wt increase of loading efficiency was observed in batch process, when drug-resin ratio was changed from 1:1 to 1:2. Hence, the drug loading performed at intermediate drug-resin ratio for indion 204. Temperature does not show significant effect on percentage drug loading.

Maximum drug loading on the resin occurs at a temperature of 50℃; a maximum of 96.38±0.27% wt/wt for indion 234. Increase in temperature above 50℃ did not further increase the percentage drug loading. Increased temperature during complexation increases ionization of drug and resin. Higher temperatures tend to increase the diffusion rate of ions by decreasing the thickness of exhaustive exchange zone. Also at increased temperature swelling of resin takes place. Due to swelling ionic sites are open for exchange of counter ions.

Table 5 : Evaluation Of Formulations

Evaluation Parameter	F-1	F-2	F-3	F-4	F-5	F-6
PH	7.2	7.2	7.2	7.2	7.2	7.2
Density	1.184	1.189	1.188	1.246	1.241	1.244
Sedimentation volume	1.30	1.29	1.28	0.99	0.99	1.00
potency	101 %	101 %	98%	99%	99%	99%
Redispersibility	+++	+++	+++	+++	+++	+++
shear thinning	1.38	1.38	1.37	1.42	1.43	1.42
thixotropic index	1.38	1.39	1.38	1.48	1.48	1.49
Taste	Sweet, palatable	Sweet, palatable	Sweet, palatable	Sweet, palatable	Sweet, palatable	Sweet, palatable
Particle size (μm)	2.02	1.86	1.78	2.09	2.14	2.25

Table 6 :Sensory Evaluation Of Suspension Formulations

TIME (sec)	Before taste masking	After taste masking with formulation (Mean±SD)					
		F-1	F-2	F-3	F-4	F-5	F-6

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	Mean±SD						
10	4.0 ±0.00	0.12 ±0.05	0.12 ±0.38	0.12 ±0.07	0.13 ±0.44	0.13 ±0.91	0.13 ±0.22
20	3.2± 0.50	0	0	0	0	0	0
30	2.4± 0.52	0	0	0	0	0	0
40	1.8± 0.50	0	0	0	0	0	0
50	1.3± 0.44	0	0	0	0	0	0
60	0.9± 0.44	0	0	0	0	0	0

Table 7 : Invitro Drug Release Profile Of Formulations

Formulation code	Cumulative percent drug release					
	Time (hrs)					
	0.5	**1.0**	**2.0**	**4.0**	**6.0**	**8.0**
F1	29.63	35.34	52.61	76.54	86.93	97.62
F2	28.12	39.76	52.45	77.31	86.84	96.83
F3	22.91	34.21	49.63	69.78	78.93	91.97
F4	19.53	28.78	39.73	67.35	78.73	89.26
F5	16.72	24.98	36.52	63.09	71.97	82.12
F6	13.34	21.32	32.12	53.47	66.42	77.89

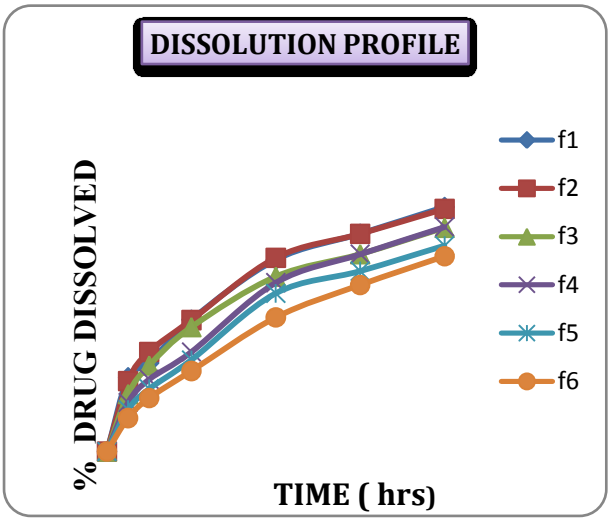

Fig 3 : Dissolution Profile Of Microencapsulated Formulations

Table 7: Correlation Coefficient According To Different Kinetic Equations

Mathematic models (kinetics)		Formulation Code					
		F-1	**F-2**	**F-3**	**F-4**	**F-5**	**F-6**
Zero order	Slope	10.88	10.73	9.999	10.54	9.784	9.33
	r^2	0.889	0.877	0.86	0.933	0.983	0.960
First order	Slope	-0.183	-0.224	-0.109	-0.107	-0.089	-0.075
	r^2	0.946	0.830	0.993	0.997	0.993	0.999
Higuchi matrix	Slope	33.52	32.84	31.15	34.14	31.99	30.95
	r^2	0.990	0.990	0.990	0.991	0.988	0.998
Peppas	Slope	0.227	0.225	0.244	0.278	0.297	0.326
	r^2	0.989	0.995	0.993	0.993	0.986	0.998
Hixson crowell	Slope	-0.225	-0.242	-0.273	-0.186	-0.195	-0.198
	r^2	0.904	0.923	0.985	0.894	0.895	0.898
BEST FIT MODEL IS " FIRST ORDER KINETICS"							

Table 8 : Average Zone Of Inhibition Of Various Microorganisms.

Micro Organisms	Average zone of Inhibition					
	F-1	F-2	F-3	F-4	F-5	F-6
S.aureus	45	46.7	49	44	45.1	48.3
B.subtilis	36.5	41	58.2	36.5	40	57.7
E.coli	32.7	34	37.3	31	33.7	36.5

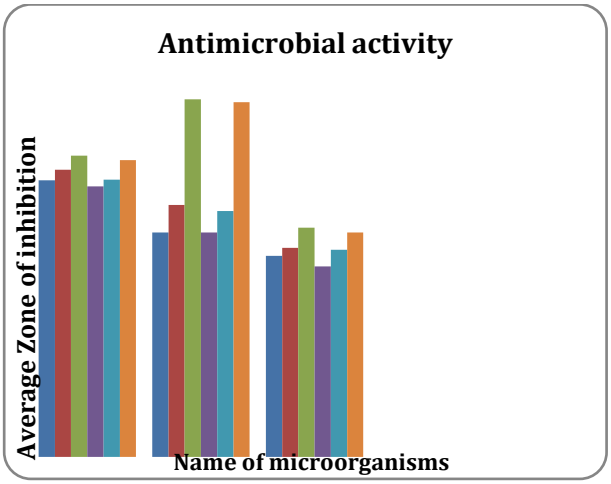

Fig 6: Antimicrobial activity of formulations against microorganisms.

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Among all the above six formulations, F-3 and F-6 formulations shows better result and more antibacterial activity.

TABLE 9 : Comparitive study of F-3 and F-6 formulations with marketed suspension of Ofloxacin

Formulations	Microorganisms			Charecteristics of formulations
	S.aureus	*B.subtilis*	*E.coli*	
OS - 1	49	58	36	➢ Half life is 3- 4 hours. ➢ Unpleasant taste.
OS – 2	49	58.2	37.3	➢ Half life is 8 hours. ➢ Taste is masked. ➢ Achieved sustained release. ➢ Zone of inhibition is more compared to Ofloxacin – carbopol 934 formulation.
OS - 3	48.3	57.7	36.5	➢ Half life is 8 hours. ➢ Taste is masked. ➢ Achieved sustained release. ➢ Zone of inhibition is less compared to Ofloxacin – HPMC formulation.

OS – 1 : Ofloxacin marketed suspension
OS - 2 : Ofloxacin – HPMC microencapsulated suspension
OS - 3 : Ofloxacin – Carbopol 934 microencapsulated suspension

Table 10 : Comparitive Study Of Cumulative % Drug Release Of F-3 And F-6 Formulations With Marketed Suspension Of Ofloxacin.

Time(hrs)	cumulative % drug release		
	OS-1	OS-2	OS-3
0	0	0	0
0.5	43.67	24.87	28.12
1	78.13	35.71	39.26
2	98.32	41.32	44.67
4	---	64.13	70.65
6	---	82.13	87.12
8	---	95.38	99.64

Invitro antibacterial activity reveals the following results in ascending order as follows :

Ofloxacin + HPMC > Ofloxacin + C934 > Ofloxacin marketed suspension.

The maximum invitro antibacterial activity was found to be with formulation F-3 (OS-2) which is combination of Ofloxacin – HPMC (30mg) and sustained release and taste masking also achieved. F-6 (OS-3) shows good result but F-3 shows best result compared to F-6. OS-1 (marketed suspension) shows antibacterial activity but less half life and unpleasant taste[38]. In this work, from the above results and discussions, the best formulation selected among different formulations is F-3. The reason is,Half life is extended to 8 hours, Taste is masked, Achieved sustained release, Maximum antibacterial activity compared to other formulation.

Summary and conclusion

The results have shown that the dissolution rate of the drug increases with increase in concentration of HPMC. The dissolution rate increase in following order.

Ofloxacin marketed suspension < Ofloxacin + C 934 < Ofloxacin + HPMC. *AND* Ofloxacin + HPMC (20mg) < Ofloxacin + HPMC (25mg) < Ofloxacin + HPMC (30mg).

The evaluation studies show all formulations passes the test, FTIR studies have proven that there is no interactions between drug and excipients, Formulations F-3, F-6 gave better sustained release and antibacterial activity. Comparative study of F-3, F-6 with marketed product reveal the F-3 is best fitted formulation for preparation of microencapsulated suspension. The release pattern of the above formulations was best fitted to Korsmeyer-Peppas model, Higuchi and zero-order model. From the experimental data obtained, it can be concluded that, Ofloxacin + HPMC (30mg) formulation suitable for formulation of microencapsulated suspension of Ofloxacin.

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