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Pharmaceutical Sciences **Research Article……!!!**

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FORMULATION AND IN-VITRO EVALUATION OF FLOATING TABLETS OF DICYCLOMINE HCL

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Dicyclomine hydrochloride, Floating tablet, Hydroxy propyl methyl cellulose, Carbopol

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ABSTRACT

The purpose of present study outlines systematic approach for designing and development of Dicyclomine Hcl Floating tablet to enhance bioavailability and therapeautic efficacy of the drug. The objective of the present investigation to develop floating tablet of Dicyclomine Hcl for treating Smooth muscle spasm, tablet was formulated by direct compression technique, sodium bi-carbonate and citric acid used as a gas generating agent in tablet. The floating tablet of Dicyclomine hcl content HPMC K100,carbopol which show sustain release up to 12 hour final optimised formulation (F1) released 99.28% in 12 hour while floating lag time was minimum and tablet remain floatable throughout the studies .

INTRODUCTION

Oral route is the most commonly employed route of drug administration. Although different route of drug administration are used for the delivery of drugs, oral route remain the preferred route. Even for sustained release system the oral route of administration has been investigated the most because of flexibility in dosage forms design that the oral route offers.[1] Floating drug delivery system (FDDS) have a bulk density less than gastric fluid and so remain buoyant in the stomach for a prolonged period of time irrespective of gastric emptying rate. While the system is floats on the gastric contents, the drug is released slowly at the desired rate from the system[5].

Classification of Floating Drug Delivery System:

a) Effervescent Floating Dosage Forms

b) Non-Effervescent Floating Dosage Forms

Drug candidate criteria for formulation:[4]

Desirable Half life (2-8 h),

Small dose,

Aqueous solubility,

G.I. Absorption Window

Synonym : Dicycloverin

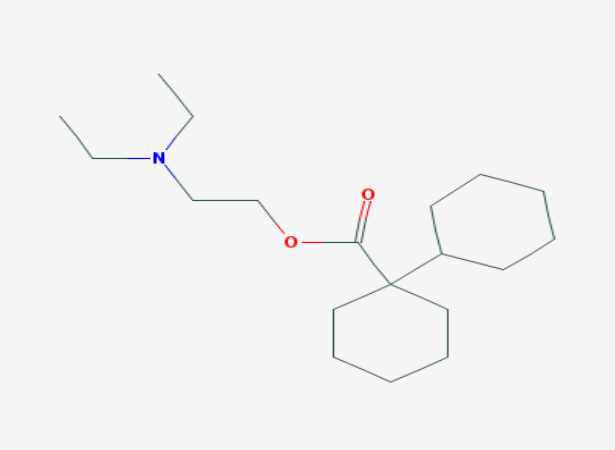

Figure no.1: Structure of Dicyclomine Hcl [9,11]

Chemical Name : 2-(diethylamino)ethyl 1-cyclohexylcyclohexane-1-carboxylate

Molecular Formula: $C_{19}H_{35}No_{2.}$ HCL

Molecular Weight: 345.95

Category: antispasmodic

Description: White crystalline powder

Solubility: Soluble in dil HCl, Water, Freely soluble in alcohol and chloroform

Melting point: 164-166^0 C

Storage: Store in cool and dry place protected from direct sunlight.

Bioavaibility: 64%

Protein binding: 98%

Half-life: 1.5-2 hrs

PKa: 8.96

Indication and Usage: It relieves smooth muscle spasm of the Gastrointestinal tract.

(irritable bowel syndrome)

MATERIALS AND METHOD

The Drug sample of Dicyclomine hcl was gifted by Blue cross Ltd, Nashik. All excipients used for formulation were obtained from modern science,Nashik.

Table no.1: List of instruments

Instrument	Manufacturer
UV Visible Spectrophotometer	SHIMADZU 2450
FT-IR Spectrometer	SHIMADZU 8400S
DSC	SHIMADZU 60
Tablet Dissolution Test Apparatus	LAB INDIA-DISOTEST, 6 F 622
Friability tester	KUMAR MFG. LTD.
Tablet compression machine	GENERAL MACHINERY CO., MUMBAI.

Manufacturing of Tablets : The corresponding amount of dicyclomine Hcl drug, HPMC, Carbopol, magnesium stearate, sodium bicarbonate, citric acid, lactose were accurately weighed.The powders were screened through screen #60. The screened powders were transfered to mortar and mixed for 20 minutes. Compression was carried out using 7mm flat-faced circular punches on rotary compression machine.[2,3]

Table no. 2: Composition of optimized formulation (F1):

Optimized formulation	Dicyclomine HCl	HPMCK 100M	CP934 P	Sod. Bicarbonate	Citric Acid	Mg-stearate	Lactose	**Total**
Quantity (mg)	20	20	5	30	15	05	105	200

Where, HPMC- Hydroxy propyl methyl cellulose

Cp- Carbopol

EVALUATION OF TABLETS: [2,3,6]

Apperiance: apperiance (colour, size, shape)of tablet is check.

Uniformity of weight: In this test 20 tablets were weighed individually and average wt. was calculated from total wt. of all tablets. The individual wt. compared with average wt. The percentage difference in the wt. variation should be within acceptable limit (7.5%)

Hardness test: This test was determined using a Monsanto tablet hardness tester.

Friability test: Friability of tablet was tested using Roche Friabilator (limit = 1%)

Thickness: Thickness of tablet was measured using screw micrometer.

***In-vitro* Buoyoncy studies**: The time required for the tablet to rise to the surface was determine as Floating lag time.

Buoyoncy (Floating) Duration: The duration of time the dosage form constantly remained on the surface of medium was determined as the Total floating time.

% swelling index studies: The swelling characteristics of the tablets were express in terms of % swelling.

Dissolution test: Dissolution apparatus-2 were used for the dissolution test of tablet.

Table no.3: Evaluation test results of optimized formulation (F1)

Test	Formulation (F1)		
Uniformity of weight (%)	198±0.10		
Hardness test (kg/cm^2)	4.33±0.288		
Friability test (%)	0.057±0.008		
Thickness (mm)	3.97±0.01		
In-vitro buoyoncy studies (sec)	35.33±0.57		
Buoyoncy (floating) duration(hr)	12± 0.577		
% swelling index studies	**4 hr**	**8 hr**	**12 hr**
	172.86	245.56	392.46
Dissolution test (%)	99.28		

Drug polymer compatibility studies: The compatibility studies were carried out to determine any kind of chemical interaction of drug with the excipients used in the preparation of stable tablet formulation. Fourier transform infrared spectra were obtained by using an FTIR spectrophotometer (SHIMADZU 8400s) [10]

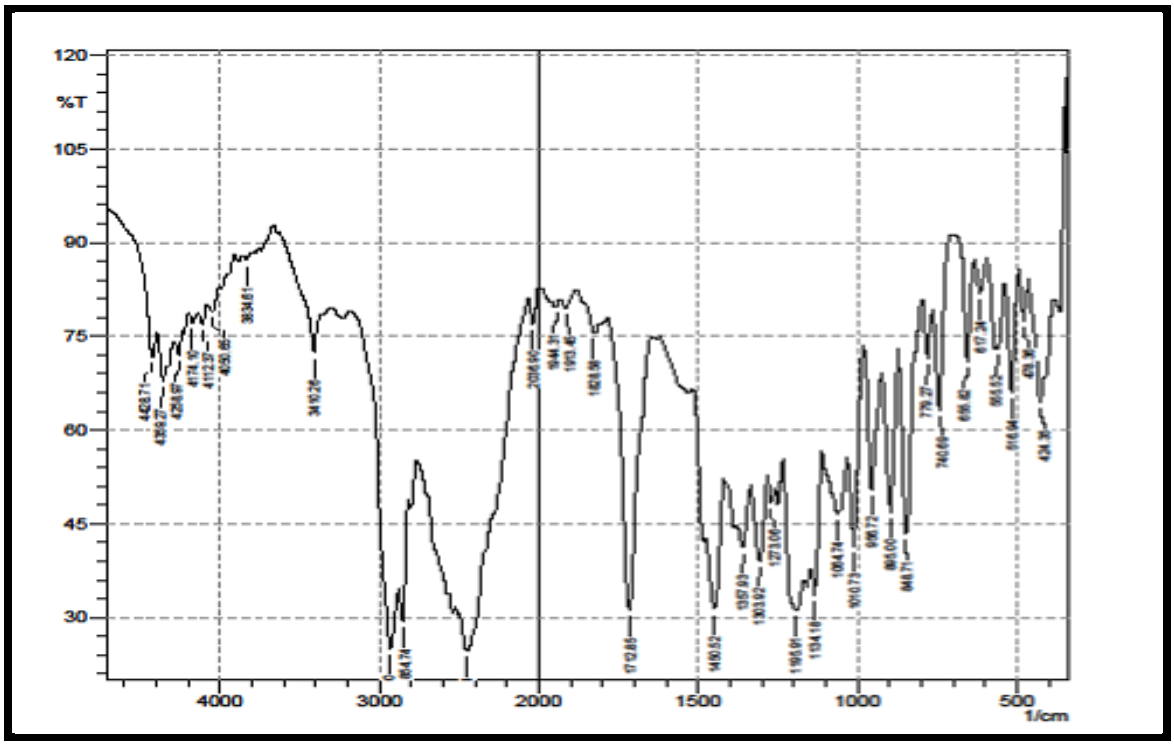

Figure no.2: FT-IR spetra of Dicyclomine Hcl

Table no.4: Interpretation of FTIR spectrum of Dicyclomine HCl

Drug	Reported Peaks	Observed Peak	Inference
Dicyclomine	1250-1020	1134.07	C-N stretching
	1300-1000	1193.85	C-O stretching
	3000-2840	2929.67	C-H stretching
	1725-1700	1718.45	C=O (ester) stretching

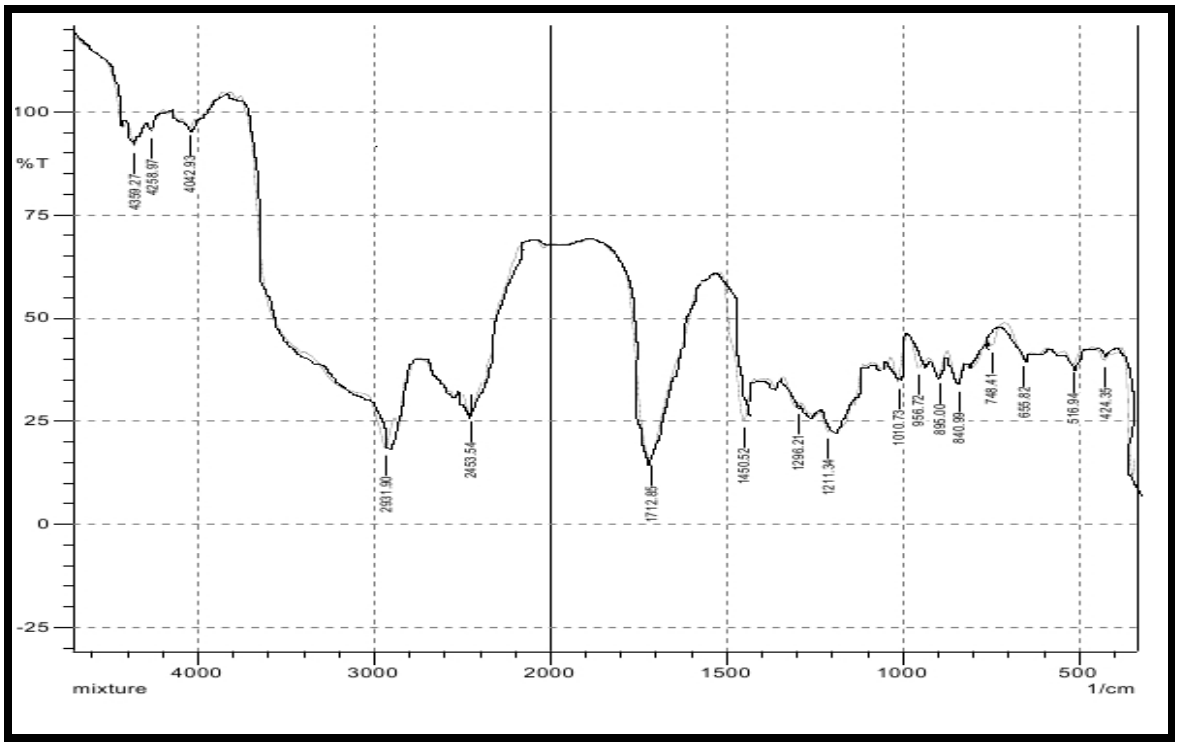

Figure no.3: FT-IR spectrum of Drug and polymer mixture

Stability testing of optimized formulation (F1): The tablets of optimized formulation was wrapped in aluminium foil and subjected to accelerated stability studies at 40^0/75% RH .

Table no.5: Stability data of optimized formulation (40^0/75%RH)

Time	% drug release (disso)
1 week	98.83±0.34
4 week	98.80±0.34

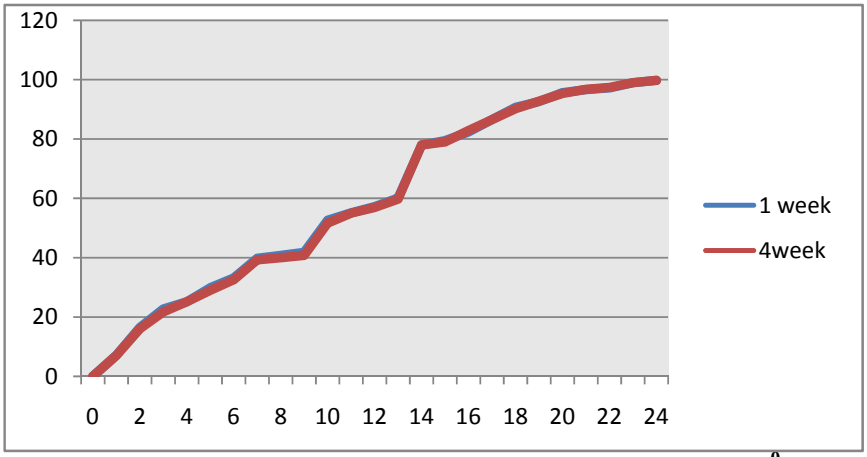

Figure no.4: Dissolution profiles of Optimized(F1) at 40^0c

RESULT AND DISCUSSION

Dicyclomine HCl is a characterized as an antispasmodic and antimuscarinic. it is more commonly prescribed for releaveing smooth muscle spasm of gastrointestinal tract It is readily absorbed from proximal part of gastrointestinal tract after oral administration. The elimination half life of tablet is 1.5-2h. The usual dose of Dicyclomine HCl tablet is 20mg four times a day. Need of the study is to, formulate and *In-vitro* evaluate Floating Tablet of Dicyclomine HCl. Evaluation of floating, swelling properties of developed formulation are shown in table no.3

Optimization of the formulation by changing the concentration of release retarding polymer has been carried out. The optimized composition is shown in table no.2 Developed a effective Floating formulation of Dicyclomine HCl. Stability Study of Optimized Formulation has been performed. Stability data of optimized formulation (40^0/75%RH) is shown in table no. 5

The received gift samples of Drug and Polymers were found to be as per standards. FT-IR, U.V. study reports shows in figure no.1 & 2 that there is drug-polymer compatibility.

From study, it has been concluded that HPMCK100M and Carbopol934P can be promising polymers for gastro retentive drug delivery systems. Swelling studies indicated significant water uptake and contributed in drug release. Swelling could also help in gastro retention. The drug release mechanism was found to be Zero order mechanism and also followed Higuchi model. The optimized formulation sustained the release of drug up to 12hrs.

Floating duration is up to 12hrs of the formulation is likely to increase its GI residence. Sustained drug release with floating duration up to 12 hours was observed in case of optimized Formulation (F1) The swollen tablet also maintained its physical integrity during the drug release study. HPMC K100M is an essential component which keeps tablet matrix integrity intact for 12hrs. CP934P shows good bioadhesion property & this may be aided by HPMCK100M.

Study reveals that as the concentration of HPMC increased, drug release was found to decrease. HPMC K100M gives significant drug retarding ability and also prevents bursting. Carbopol934P acts as release retarding polymer.

The optimized formulation was found to be stable in short-term accelerated testing done for one month at 40^0C. There has been no significant difference in dissolution profile, hardness and physical appearance.

CONCLUSION

From the all In-vitro evaluation data and stability study it is found that the floating tablet of Dicyclomine Hcl satisfactory complies the results. So it can be use for manufacturing.

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