SPECTROPHOTOMETRIC DETERMINATION OF PARACETAMOL AND DICLOFENAC IN COMBINED DOSAGE FORM BY SIMULTANEOUS EQUATION METHOD USING UV–VIS SPECTROPHOTOMETRY

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Abstract

A simple spectrophotometric method is developed for simultaneous estimation of paracetamol and diclofenac in bulk and pharmaceutical dosage form. Thepresent study was employed to determine the % purity of drugs in combined dosage form. The S.D. is found to be 0.0375 and the%RSD is found to be 1.299%. The method is validated according to ICH guidelines. From data generated in this method it was revealed that the method is precise, accurate and sensitive. Literature review reveals that a there is no suitable method for determination of this combined dosage form. This simple UV method is followed to determine the %purity of the combined dosage form. By this procedure the analysis of the components were done without prior separation and without interference of excipients. For the analysis of components by simultaneous estimation method two wavelengths are selected one is λmax of paracetamol i.e. 247nm and other one is λmax of diclofenac i.e. 280nm. The developed method was successfully applied for routine analysis of drugs.

Key words:paracetamol,diclofenac, simultaneous estimation, UV method, % purity.

INTRODUCTION

Paracetamol is N-(4-hydroxy phenyl) acetamide para aminophenol and diclofenac is 2-(2-(2, 6-dichlorophenyl amino) phenyl) acetic acid [5]. This research work suggested a method which is simple, precise, inexpensive, less time consuming and accurate. Paracetamol is commonly used in multi-ingredient preparation for migraine, headache and antipyretic action

[6]. The main mechanism proposed is the inhibition of cyclooxygenase (COX), it is highly selective for COX-2.Diclofenac is an anti-inflammatory agent. The exact mechanism of action[7] is unknown but is thought to be inhibiting prostaglandin synthesis by inhibiting cyclooxygenase. It appears to exhibit bacteriostatic activity by inhibiting bacterial DNA synthesis [8]. The proposed method is an attempt to develop an easy but accurate method for estimation of the combined dosage form. The method is optimized and statistically validated as per ICH guidelines.

MATERIALS AND METHODS

Methanol, distilled water, 0.1N H2so4, 0.1N HcL, 0.1nNaOH are procured from S.D. fine chemicals, Mumbai. Paracetamol and diclofenac tablets are obtained from local market. Pure samples of paracetamol and diclofenac were obtained as a gift sample from vista pharmaceuticals pvt.ltd, narketpally. All the chemicals used throughout the experiment are analytical grade.

Preparation of stock solution

Inorder to get the stock solution 10mg of each drug were taken and diluted to 10ml in 10 ml volumetric flask separately to get 1000µg/ml for each. These solutions were diluted suitable to get 10µg/ml. Inorder to ascertain the λmax of paracetamol and diclofenac, different solution of drugs 10µg/ml in methanol were scanned differently using spectrophotometer with in the wavelength region of 200-400nm against methanol as blank.
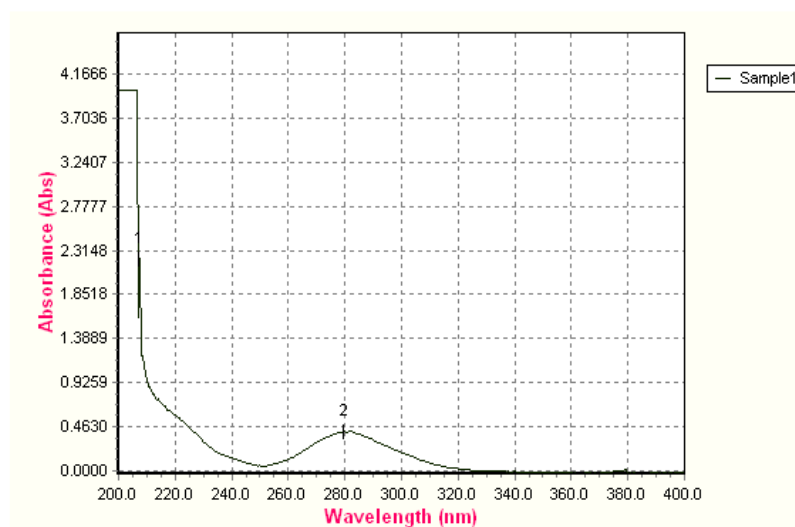

Standard graphof diclofenac
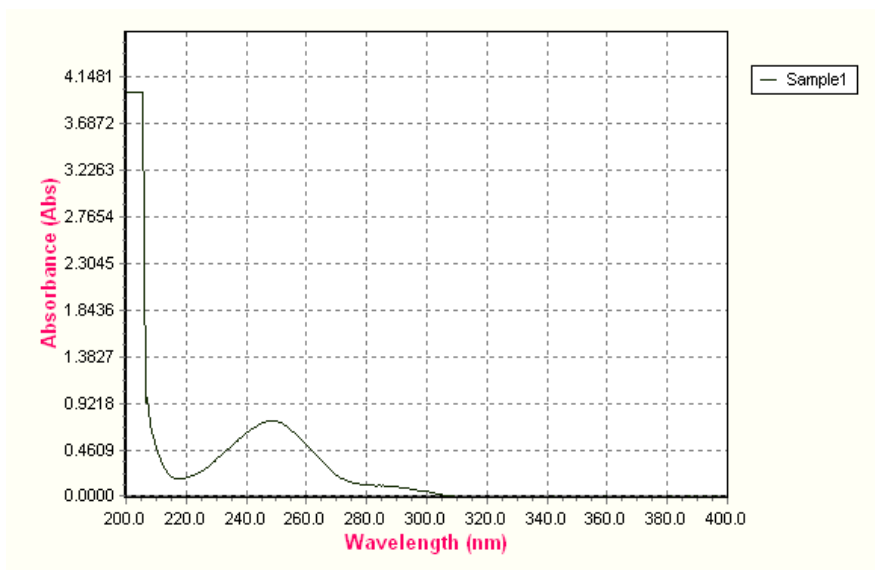
Standard graph of paracetamol

Construction of standard graph

The prepared stock solution were further diluted with methanol to get working standard solutions of 100 µg/ml and 10µg/ml of paracetamol and diclofenac separately. To construct beers law plot for pure drug,different aliquots of both drugs were taken and diluted to 10ml with methanol separately. The absorbances were measured at 280nm for diclofenac and 247nm for paracetamol against methanol.

DICLOFENAC SODIUM STANDARD GRAPH

$y = 0.0618x - 0.017$
$R^2 = 0.9963$
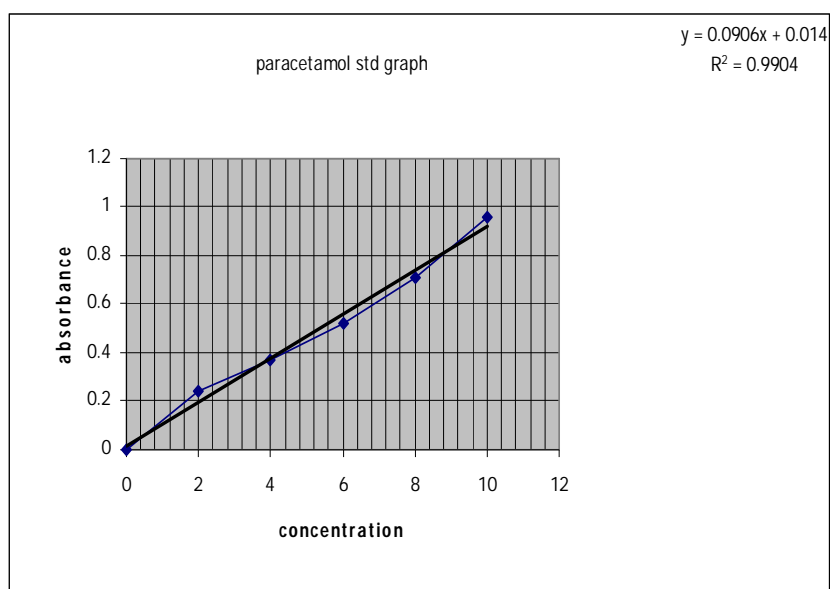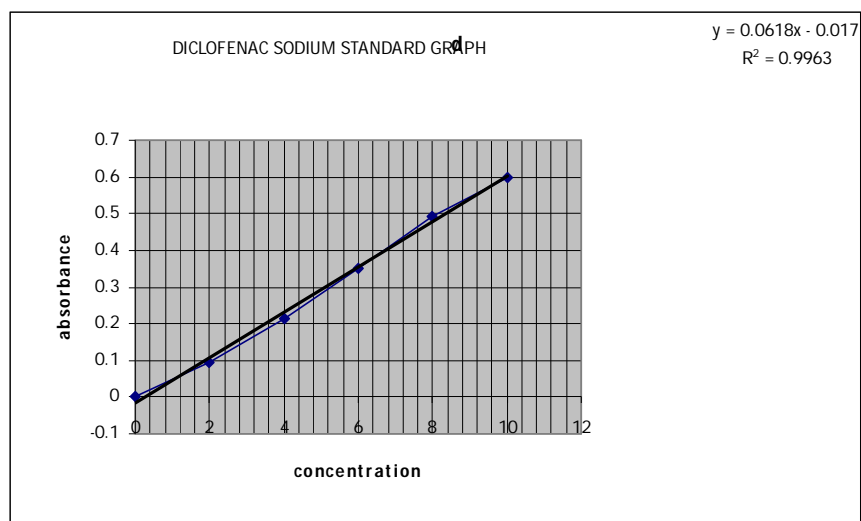
Overlay spectra of diclofenac and paracetamol
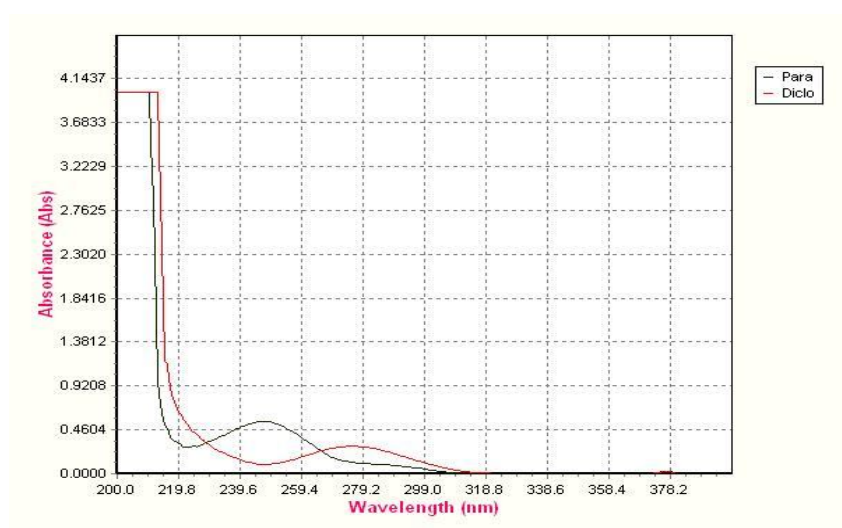
Estimation of paracetamol and diclofenac in sample

Methodology:[1-3]

Simultaneous equation method uses two selected wavelengths, one is λmax of paracetamol and other is λmax of diclofenac. The stock solutions of both the drugs were further diluted separately with methanol to get a series of standard solutions of 2-12μg/ml for paracetamol and 2-40μg/ml for diclofenac for both drugs calculated at both wavelengths. Concentrations in the sample were obtained by using these equations.

Cx =A1ay2-A2ay1/ax1ay2-ax2ay1……………………eq-1

Cy =A1ax2-A2ax1/ay1ax2-ay2ax1…………………eq-2

A1 and A2 are absorbances of mixture at 247nm and 280nm respectively.

ax1 and ax2 are absorptivitys of diclofenac at λ1 and λ2 respectively.

ay1 and ay2are absorptivitys of paracetamol at λ1 and λ2 respectively.

CxandCy are concentration of diclofenac and paracetamol respectively.

RESULTS AND DISCUSSION

Validation parameters:[4]

Prescion table:

Paracetamol			diclofenac		
Con.	Absorbance	Mean= 0.8113 SD = 0.0375 %RSD =4.622	Con.	absorbance	Mean= 0.3429 SD=0.01861 %RSD=5.42724
10 µg/ml	0.7731		10 µg/ml	0.3652	
10 µg/ml	0.8124		10 µg/ml	0.3341	
10 µg/ml	0.7712		10 µg/ml	0.3196	
10 µg/ml	0.8008		10 µg/ml	0.3647	
10 µg/ml	0.8552		10 µg/ml	0.3311	
10 µg/ml	0.8555		10 µg/ml	0.3437	

Accuracy table: **Paracetamol and Diclofenac**

Samp.	Pure Drug	Form.	%recov.	Stat.anal.	Samp.	Pure drug	Form.	%recov.	Stat.anal.
S1 80%	8 µg/ml	10 µg/ml	104.3%	Mean= 103.94% SD=3.3 %RSD=3.174 %	S1 80%	8 µg/ml	10 µg/ml	105.29%	Mean=102.79% SD=4.77 %RSD=4.64%
S2 80%	8 µg/ml	10 µg/ml	100.6%		S2 80%	8 µg/ml	10 µg/ml	97.35%	
S3 80%	8 µg/ml	10 µg/ml	106.94%		S3 80%	8 µg/ml	10 µg/ml	105.73%	
S1 100%	10 µg/ml	10 µg/ml	104.3%	Mean= 102.06% SD=1.950 %RSD=1.9104	S1 100%	10 µg/ml	10 µg/ml	100.70%	Mean=101.56% SD=1.3 %RSD=1.299%
S2 100%	10 µg/ml	10 µg/ml	101.2%		S2 100%	10 µg/ml	10 µg/ml	102.86%	
S3 100%	10 µg/ml	10 µg/ml	100.7%		S3 100%	10 µg/ml	10 µg/ml	101.13%	
S1 120%	12 µg/ml	10 µg/ml	99.80%	Mean=97.98 % SD=1.60 %RSD=1.632	S1 120%	12 µg/ml	10 µg/ml	96.7%	Mean=99.55% SD=2.92 %RSD=2.93%
S2 120%	12 µg/ml	10 µg/ml	96.79%		S2 120%	12 µg/ml	10 µg/ml	99.4%	
S3 120%	12 µg/ml	10 µg/ml	97.35%		S3 120%	12 µg/ml	10 µg/ml	102.86%	

Specificity data

paracetamol				Diclofenac			
Conc. (µg/ml)	solvent	Abs.	Amnt.	Conc. (µg/ml)	solvent	Abs.	Amnt
10	0.1NNaoH	0.88	10.84	10	0.1NNaoH	1.058	9.58
10	0.1N HcL	0.83	10.11	10	0.1N HcL	1.028	9.32
10	0.1nH2So4	0.85	10.32	10	0.1nH2So4	1.030	9.33
10	Dist. H2O	0.86	10.48	10	Dist. H2O	1.048	9.49

Optical characteristics

parameters	paracetamol	diclofenac
λmax	247nm	280nm
Beer's limit	2-12 µg/ml	2-40 µg/ml
Regression eqn.	Y=0.0906x+0.014	Y=0.0618 x-0.017
Correlation coefficient	0.9904	0.9963
LOD	0.1516	0.3317
LOQ	0.05004	0.1094
Slope (a)	0.0906	0.0618
Intercept(b)	0.014	0.017

In simultaneous estimation method two wavelengths were used for analysis of drugs i.e. lambda max of paracetamol, 247nm and λmax of diclofenac, 280nm. After optimization of the method, process was validated statistically. The %RSD was found to be 1.632 shows that the method was accurate and precise.% purity were found to be104% for diclofenac and 110% for paracetamol which were within the permissiblelimit. From the beers law limit it concluded that paracetamol follows the range 2-12 µg/ml and diclofenac 2-40 µg/ml.The all statistical results shows thatmethod was genuine, precise, simpleand sensitive.

CONCLUSION

A proposed spectrophotometric method was found to be simple in expensive and precise fordetermination of paracetamol and diclofenacin their commercial formulation. The analysis

of the mixture was done without any interference of excipients and additives. The simultaneous determination of the cited drugs in pure and tablet forms were done without any preliminary separation step so the present method is more economical and less time consuming compared to other chromatographic methods.

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