Srinivasa Rao Narala et al /J. Pharm. Sci. & Res. Vol.3(1), 2011,1002-1004

ISSN:0975-1459
Journal of Pharmaceutical Sciences and Research
www.jpsr.pharmainfo.in

RP- HPLC Methods for the Determination of Cephalosporins (Cefditoren Pivoxil and Cefdinir) in Pharmaceutical Dosage Forms

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Abstract :
Two simple and precise reverse phase high performance liquid chromatographic methods have been developed for the determination of Cefditoren Pivoxil and Cefdinir in pharmaceutical dosage forms. These methods are carried out in an isocratic mode using Kromosil C18 column (250 x 4.6 mm, 5µ) with a mobile phase comprised of methanol and 0.025M potassium dihydrogen phosphate buffer (75:25 v/v) at a flow rate of 1ml/min. with effluent detection at 231 nm for Cefditoren Pivoxil and a mobile phase comprised of acetonitrile and 0.01M potassium dihydrogen phosphate buffer (70:30 v/v) at a flow rate of 1ml/min. with effluent detection at 285 nm for Cefdinir. The retention times were found to be 2.75 min. for Cefditoren Pivoxil and 2.97 min. for Cefdinir. Linearity was obtained in the concentration range of 40-120 µg/ml for Cefditoren Pivoxil and 20-100 µg/ml for Cefdinir. These methods are accurate, precise and found to be suitable for the quantitative analysis of these drugs in pharmaceutical dosage forms.
Key words : RP-HPLC, Cefditoren Pivoxil, Cefdinir, Recovery experiments.

Introduction:

Cefditoren Pivoxil is chemically (6R)-7-[[(2Z)-2-(2-amino -1,3-thiazol-4-yl)-2-methoxyiminoacetyl] amino]- 3- [(Z)-2 -(4-methyl-1,3-thiazol-5-yl) ethenyl]-8-oxo-5-thia-1- aza bicyclo [4.2.0] oct-2-ene-2-carboxylic acid. It is a third generation cephalosporin with antibacterial activity against gram-positive and gram-negative pathogens. A few HPLC[1-2] methods were reported earlier for the determination of Cefditoren Pivoxil in human plasma and pharmaceutical dosage forms.

Cefdinir is chemically (6R,7R)-7-[[(2Z)-2-(2-amino-1,3-thiazol-4-yl)-2-hydroxy iminoacetyl]amino]-3-ethenyl-8-oxo-5 - thia-1-azabicyclo [4.2.0] oct-2-ene-2-carboxylic acid. It is a semi-synthetic, broad-spectrum antibiotic in the third generation of the cephalosporin class, proven effective for common bacterial infections of the ear, sinus, throat and skin. There are very few analytical methods[3-9] were reported for the estimation of Cefdinir which includes HPLC and spectrophotometric methods.

This paper now describes two simple and accurate RP-HPLC methods for the determination of Cefditoren Pivoxil and Cefdinir in pharmaceutical dosage forms.

Experimental:

a) **Instrumentation:**

The instrument used was PEAK LC – P 7000 Isocratic pump equipped with UV detector.

Chemicals and Reagents:

Cefditoren Pivoxil and Cefdinir were obtained from local pharmaceutical laboratories, Hyderabad. Potassium dihydrogen phosphate and orthophosphoric acid were A.R. grade from SD fine chemicals, Mumbai. Methanol and acetonitrile were HPLC grade from Merk chemicals, Mumbai.

b) **Chromatographic conditions**:

For Cefditoren Pivoxil

A PEAK HPLC system equipped with a kromosil C18 column (5µ, 250mm x 4.6mm) as stationary phase with injection volume of 20µl. The mobile phase comprised of methanol and 0.025M potassium dihydrogen phosphate (pH adjusted to 6.0 with ortho phosphoric acid) in the ratio 75:25 at a flow rate of 1ml/min. with effluent detection at 231 nm.

For Cefdinir

The chromatographic separation was carried out using kromosil C18 column (5µ, 250mm x 4.6mm) as stationary phase with injection volume of 20µl. The mobile phase comprised of acetonitrile and 0.01M potassium dihydrogen phosphate (pH adjusted to 2.0 with ortho phosphoric acid) in the ratio 70:30 at a flow rate of 1ml/min. with effluent detection at 285 nm.

Preparation of standard solutions:
50mg of Cefditoren Pivoxil or Cefdinir was accurately weighed and transferred into a 100 ml volumetric flask, dissolved in mobile phase to obtain a stock solution containing 500 µg/ml. It was diluted to obtain the working standard concentrations ranging from 0-150 µg/ml.

Preparation of sample solution:
Accurately weighed formulation (tablet or capsule) powder equivalent to 50 mg of drug was transferred to a 100 ml volumetric flask. About 20ml of mobile phase was added and sonicated for 10min. filtered through 0.45 µm membrane filter and the volume was made to the mark with mobile phase to get the stock solution. From this suitable dilutions were made to obtain the concentrations ranging from 0-150 µg/ml.

Assay Procedure:
Various standard concentrations of Cefditoren Pivoxil or Cefdinir ranging from 0-150 µg/ml were prepared in mobile phase. The contents of the mobile phase were filtered before use through 0.45 µm membrane filter, degassed with a helium sponge for 15 min. and pumped from the respective solvent reservoirs to the column at a specified flow rate. Prior to injection of the drug, the mobile phase was pumped for about 30 min. to saturate the column there by to get the base line corrected, then 20 µl of each of the drug solution was injected for five times. Quantitative determinations were made by comparison of the peak area from a standard injection. The amount of Cefditoren Pivoxil or Cefdinir present in the sample was calculated through the calibration curve.

Results & Discussion:
Linearity
The calibration curve was constructed by plotting peak area against concentration of solution (Fig. 1 and 2). The proposed methods were evaluated by its correlation coefficients. They were represented by the linear regression equation. Slope and intercept were obtained by using regression equation and are presented in Table – 1. The chromatograms are showed in figs. 3 and 4.

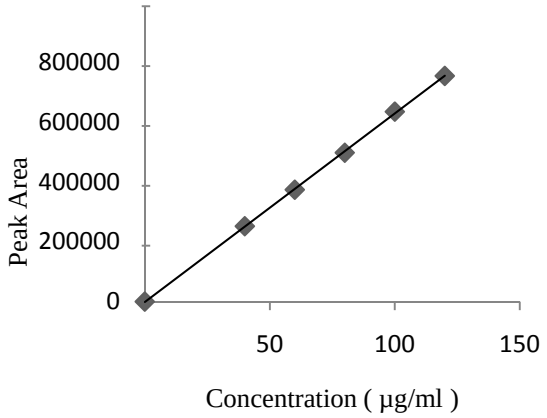

Fig. 1. Linearity Curve of Cefditoren Pivoxil

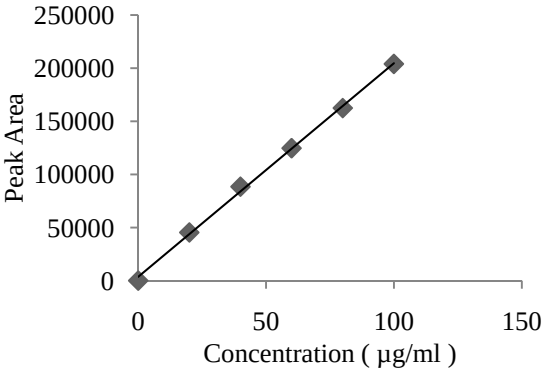

Fig. 2. Linearity Curve of Cefdinir

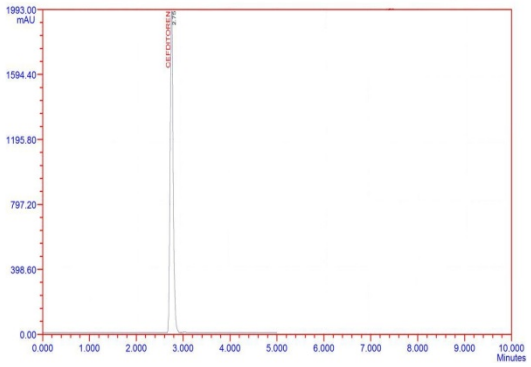

Fig. 3. Chromatogram of Cefditoren Pivoxil

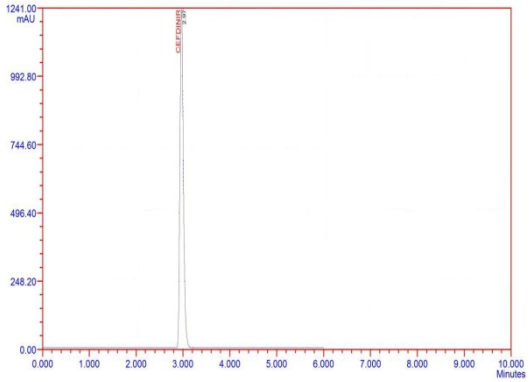

Fig. 4. Chromatogram of Cefdinir

Table- 1: Analytical parameters of Proposed methods

Parameter	*Cefditoren Pivoxil*	*Cefdinir*
Linearity range (µg /ml)	40-120	20-100
Slope (m)	6328.69	1995.75
Intercept (b)	- 3488.0	7601.8
Correlation coefficient (r)	0.9998	0.9996

Table -2: System suitability parameters

Parameter	*Cefditoren Pivoxil*	*Cefdinir*
Wavelenth	231	285
Retention time (min.)	2.75	2.97
Theoretical plates	7464	6471
Tailing factor	1.46	1.57
Calibration range (µg/ml)	40-120	20-100
Limit of detection	3.0412	3.2321
Limit of quantification	10.1373	10.7736

Table – 3: Assay of commercial formulations by proposed methods

Drug	*Formulation type*	*Labeled amount mg/tablet or capsule*	*Amount found**	*% Recovery **
Cefditoren	Tablet-1	200	199.88±0.057	99.86±0.091
Pivoxil	Tablet-2	200	199.90±0.036	99.74±0.262
Cefdinir	Capsule-1	300	299.89±0.038	99.96±0.067
	Capsule-2	300	299.92±0.047	99.84±0.085

* Mean of five determinations

** Mean of three determinations

System suitability parameters

The system suitability parameters like No.of theoretical plates, tailing factor, retention time, calibration range, LOD and LOQ were calculated for the standard solutions under the optimized chromatographic conditions. These values are presented in Table-2.

Assay and recovery study

To determine the accuracy of the proposed methods, recovery experiments were carried by standard addition method. The values of recovery experiments and assay of commercial formulations are presented in Table-3.

Conclusion:

The proposed chromatographic methods are simple, rapid and accurate for the determination of Cefditoren Pivoxil and Cefdinir in pharmaceutical dosage forms and can be used for routine quality control of these drugs in formulations.

Acknowledgements:

The authors express their gratitude to the Management R.V.R. & J.C. College of Engineering, Guntur for providing their continuous support throughout the work.

References:

[1]. Rieck, W., Platt,D., Clin Lab. 2000, 46 (9-10) 477-82.

[2]. Qi Liu, Ji-Hong Yao, Cheng-Ye Su, Guo-zhu Han, Hui-Jun Sun, Kun Wang, Xu Han, Bin Qu and Ke-Xin Liu. Assian journal of pharmaco dynamics and pharmacokinetics, 2006, 6(3) , 214 -218.

[3]. Al-Momani,I.F; J.Pharm. Biomed. Anal. 2001, 25, 751.

[4]. Gandimathi,M., Suganthi,A., Ravi,T.K., Minu B Pattassaril., Indian J. Pham. Sci. 2004, 66(2) , 248-249.

[5]. Shah,P.B; Pundarikakshudu,K; Indian J. Pharm. Sci. 2004, 66, 665.

[6]. Prasada ao,K.V.V., Rani,A., Raghava Reddy,A.V., Bharathi,C.H., Ramesh Dandala, Naidu,A., J.Pham. Biomed. Anal. 2007, 43(4) 1476-1482.

[7]. Jain,R., Radhapyari,K., Jadon, N., J.Electrochem.Soc. 2007, 154, 199.

[8]. Nageswara Rao,R., Venkateswarlu,N., Narasimha,R., J.Chromatogr.A 2008, 1187, 151.

[9]. Babita,K., Singh e Dilip V. Parwate., Quim. Nova, 2010, 33(7) , 1471-1475.