UV Spectroscopic and Colorimetric Methods for the Estimation of Cefdinir in Capsule Dosage Forms

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Accepted 28 June 2004
Revised 5 April 2004
Received 4 August 2003

Two simple and sensitive spectroscopic methods in ultraviolet and visible region were developed for the estimation of cefdinir in pharmaceutical dosage forms. In method A cefdinir showed absorption maximum at 287 nm in 0.1 M phosphate buffer (pH 7.0), whereas in method B, it reacted with Folin-Ciocalteu reagent under alkaline conditions forming a blue coloured chromogen having absorption maximum at 720 nm. These methods obey Beer's law in the concentration range of 3 to 17 μg/ml and 4 to 20 μg/ml, respectively. The methods are statistically evaluated for accuracy and precision.

Cefdinir is chemically [6R-[6α,7β(Z)]]-7-[[(2-amino-4-thiazolyl) (hydroxyimino)acetyl] amino]-3-ethyl-8-oxo-5-thia-1-azabicyclo (4.2.0.)oct-2-one-2-carboxylic acid.[1] It is a broad-spectrum oral cephalosporin active against gram positive and gram negative bacteria[2]. It is used for the treatment of mild to moderate upper and lower respiratory tract infections. It is also used for the treatment of acute bacterial otitis media, streptococcal pharyngitis[3] and tonsillitis and uncomplicated skin structure infection. It is official in Martindale-The Extra Pharmacopoeia[4]. Literature survey revealed that a HPLC method has been reported for the estimation of cefdinir and its related impurities[5].

We report here two simple and sensitive spectroscopic methods for the analysis of cefdinir from pharmaceutical dosage forms. The methods were validated by employing suitable statistical methods. Cefdinir is dissolved in 0.1 M phosphate buffer (pH 7.0) which showed maximum absorption of 287 nm (method A) and in method B, cefdinir formed a blue colour chromogen on treatment with Folin-Ciocalteu (FC) reagent in alkali media, with a maximum absorption at 720 nm.

All the reagents used were of analytical grade. Solution of sodium hydroxide (1 N), FC reagent (1 N) and phosphate buffer 0.1 M (pH 7.0) were prepared in double distilled water. A standard solution of cefdinir (1 mg/ml) was prepared in 0.1 M phosphate buffer and further suitable dilutions were made with the buffer to get working standard solution of 100 μg/ml.

Aliquots of working standard cefdinir (0.1–1.7 ml) solutions were transferred into a series of 10 ml volumetric flasks and the volume was made up to 10 ml with 0.1 M phosphate buffer. The absorption of each solution was measured at 287 nm against buffer as blank.

Into a series of 10 ml volumetric flasks, aliquots of working standard (0.1–2.0 ml) were transferred and 1 ml of sodium hydroxide (1 N) solution and 2 ml of FC reagent (1 N) were added into each flask and the final volume was made to 10 ml with distilled water. The absorbance of the resulting blue color chromogen was measured at 720 nm against a reagent blank. The amounts of cefdinir present in capsules were estimated by computing from their respective calibration curves. Spectral and absorbance measurements were made on Shimadzu 1601 UV/Vis spectrophotometer by using 1 cm matched quartz cells.

The optical characteristics such as Beer's law limits, Sandell's sensitivity, stability, molar extinction coefficient, %

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TABLE 1: OPTICAL CHARACTERISTICS AND PRECISION

Parameters	Method A	Method B
Absorption Maxima	287 nm	720 nm
Beer's law limit (µg/ml)	3 to 17	4 to 20
Correlation Coefficient (r)	0.9998	0.9993
Molar Extinction Coefficient (l/mol.cm)	2.216 x 10^6	1.793 x 10^6
Sandell's Sensitivity (µg/cm^2/0.001)	0.00018	0.00022
Regression equation (Y=mx + C)		
Slope (m)	0.0568	0.0444
Intercept (C)	0.0139	0.0069
% Relative Standard Deviation	1.88	1.68
% Range of Error		
0.05 confidence limits	0.1668	0.1390
0.01 confidence limits	0.2760	0.2300

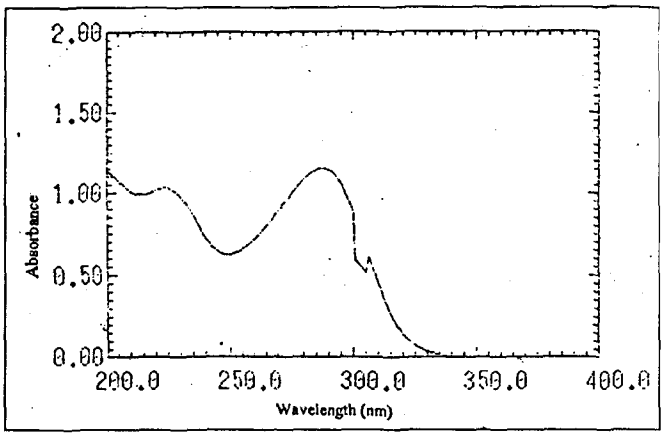

Fig. 1: Absorption spectra of cefdinir showing λ_{max} at 287 nm in Phosphate buffer.

the method developed, the colour intensity of blue chromogen was intensified with 2 ml of FC reagent. Stability of colour complex was determined by measuring absorbance of the chromogen at specified time intervals and was found to be stable for 70 min. These results indicate that the proposed methods are simple, sensitive and reproducible.

TABLE 2: ANALYSIS OF CEFDINIR FORMULATION BY PROPOSED METHODS

Formulations	Labeled amount (mg)	Amount Estimated* (mg)		% Recovery*	
		Method A	Method B	Method A	Method B
1	300	304±0.06	305±0.08	100±0.50	101±0.33
2	300	299±0.04	299±0.04	98.5±0.33	98.9±0.70

*Values are Mean±S.E.M of five determinations. Formulation 1 is Adcef, 300 mg capsules from Torrent Pharmaceuticals, Ahmedabad and formulation 2 is Sefdin 300 mg capsules from Unichem Laboratories, Mumbai.

relative standard deviation and % range of error for the proposed two methods are summarized in Table 1. Recovery experiments were performed by adding known amount of drug to previously analyzed pharmaceutical formulations. The results obtained by the proposed methods were in good agreement with the labeled amounts (Table 2).

In method A, cefdinir exhibit λ_{max} at 287 nm in 0.1 M phosphate buffer (fig. 1). In method B, it is based on the reduction of phosphomolybdotungustic acid, the FC reagent by cefdinir in presence of 1 N sodium hydroxide, thereby producing reduced species, the blue colour chromogen. In

ACKNOWLEDGEMENTS

The authors are thankful to the Torrent Research Center, Bhat for providing gift sample of drug and Shri B. M. Shah College of Pharmacy, Modasa for providing laboratory facilities.

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Hepatoprotective Activity of Root Extracts of *Boerhaavia erecta* L. and *B. rependa* L.

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Accepted 18 July 2004
Revised 5 April 2004
Received 2 July 2003

Administration of alcoholic extracts of roots of *Boerhaavia erecta* L. and *B. rependa* L protect the liver from the toxic effect of CCl_4 by restoring the levels of serum bilirubin, serum total protein, albumin and subsequent decrease in the levels of serum globulin in experimental rats. The serum alanine transaminase, aspartate transaminase and alkaline phosphatase activities were also restored as compared to the normal rats. The hepatoprotective activity was evaluated to be more in *B. erecta* root extract treated groups.

The indigenous drug *Punarnava* obtained from the genus *Boerhaavia* L. (Nyctaginaceae) is known to be used for the treatment of inflammatory oedema[1,2], liver cirrhosis, diuretic and asthma[3]. *Boerhaavia erecta* L., (*B. punarnava* Shah.) is an erect, glabrescent and white flowered herb and *B. rependa* L., is a scandant climber with tubular purplish flowers and exerted stamens. Phytochemical analysis of the roots and leaves of these species showed the presence of alkaloid Punarnavine and reduced sugars[4]. The tribal community Soligas of the Biligiri Rangana Hill ranges, Karnataka, used the roots of *B. erecta* with goat's milk to cure infective hepatitis as a tribal medicinal practice. The traditional practitioners of Yalandur, Chamarajanagar district of Karnataka used the roots of *B. rependa* with butter milk to heal jaundice[5].

In the genus *Boerhaavia* L. clinical evaluation of hepatoprotective activity of the roots was reported only for *B. diffusa*[6,7]. In the present communication we report the comparative hepatoprotective efficacy of the alcoholic extracts of the roots of *B erecta* and *B. rependa* against carbon tetrachloride (CCl_4)-induced toxic hepatitis in Wistar rats.

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Roots of *Boerhaavia erecta* were collected from the forests of Biligiri Rangana Hill range and the roots of *B. rependa* collected from the agricultural waste lands of in and around Yalandur, Chamarajanagara district, Karnataka. The roots were thoroughly washed, cut into small pieces, dried in an oven at 70° for 4 d and powdered mechanically. One hundred grams each of the powdered roots of *B. erecta* and *B. rependa* were taken separately in a Soxhlet apparatus and refluxed with 50% ethanol for 4 d. The extracts were concentrated in vacuum using a rotary flash evaporator and the solvent was removed completely over a water bath and dried in a desiccator.

Male Wistar rats, weighing 175-200 g were obtained from the Central animal house, Department of Zoology, University of Mysore, Mysore. The experimental animals were divided into four groups of 16 each.. The group-I animals were treated as control. Hepatotoxicity was induced in the animals of group-II, III and IV by oral administration of CCl_4 (0.2 ml/100 g body weight). Feeding was done biweekly for four weeks. From third day onwards, the group-III and group-IV animals received an oral dose (100 mg/100 g b w for 25 d) of root extract of *B. erecta* and of *B .rependa*, respectively. All the animals were fed on commercial standard pellet diet (Hindustan Lever Ltd., Mumbai), water *ad libitum* and were maintained in the animal house (Zoology Department,