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# Spectrophotmetric Determination of Cefpodoxime Proxetil in Tablets

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A new simple spectrophotometric method for the assay of cefpodoxime proxetil (CEFP) has been described. Haematoxylin, [7,11-b-dihydrobenz-b-indeno-(1,2-d)-pyran-3,4,6a,9,10-6(h)-pentol] is a catechol derivative from the log wood (haematoxylin campeachianum), when treated with an oxidizing agent, undergoes oxidation to yield haematin. The colour species formation may be attributed to the formation of charge transfer complex between *in situ* formed haematin from haematoxylin-chtoramine-T (CAT) and -S:-portion in cefpodoxime proxetil. The $\lambda_{max}$ was at 555 nm. The proposed method is selective, simple and accurate. The results obtained are reproducible and statistically validated.

**Key Words: Spectrophotometric, Cefpodoxime proxetil, Haematoxylin, Chloramine-T, Charge transfer complex.**

## INTRODUCTION

Cefpodoxime proxetil is an excellent antibacterial activity against entero bacteriaceae and other gram negative bacilli. Its chemical name RS-1 isopropoxy carbonyloxy)ethyl (+)-(6R,7R)-7-[2-(2-amino-4-thiazolyl)-2-[(Z)-methoxy imino]acetamido-3-methoxy methyl-8-oxo-5-thia-1-azabicyclo[4.2.1]oct-2-ene-2-carboxylate. Among the preferred methods HPLC methods[1-4] were found from the literature survey, however they involved sophisticated instruments which are very expensive and pose problem of maintenance. When suitable HPLC equipment is not available, an alternate can be chosen is to combine a precise quantitative assay such as spectrophotometeric (visible or colorimetry)[5-7], voltammetric[8], electrochemical reduction[9], *etc.*

Haematoxylin or its oxidized form (haematin) has been widely used for the determination of several metal ions (aluminium[10], arsenic[11], tin[12] and molybdenum[13]). Sastry *et al.*[14,15] reported spectrophotmetric methods for the determination of several organo sulfur compounds such as pencillins[14], cephalosporins[14], promethiazine hydrochloride[15] using haematoxylin-CAT as a reagent. In this method, haematoxylin-CAT involved the charge transfer complex formation. The haematoxylin-CAT used as a new chromogenic agent in simple spectrophotometric method for the assay of cefpodoxime proxetil (CEFP) is described here.

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## EXPERIMENTAL

An Elico, UV-visible digital spectrophotometer with 1 cm matched quartz cells were used for the spectral and absorbance measurements. An Elico L1-120 digital pH meter was used for pH measurements.

All the chemicals and reagents used were analytical grade and the solutions were prepared freshly. Haematoxylin solution (Aldrich, 0.2 %, $6.625 \times 10^{-3}$ M) was prepared by dissolving the required amount of haematoxylin in 100 mL methanol. CAT solution (Loba, 0.4 %, $1.412 \times 10^{-2}$ M) was prepared by dissolving the required amount in 100 mL of distilled water. A solution of pH 7.0 buffer was prepared freshly.

**Preparation of standard drug solution:** A 1mg/mL stock solution of CEFP was prepared by dissolving 100 mg of the drug in aldehyde free 100 mL methanol. This stock solution was further diluted with appropriate solvent to get the working standard solutions (400 µg/mL).

**Pharmaceutical formulation solution:** Tablets were mixed thoroughly and 20 tablets were selected at random and grinded to a fine powder. A portion of the mixed powder, equivalent to 100 mg of CEFP was dissolved in methanol (2 mL × 15 mL) and filtered. The combined filtrate was evaporated to dryness and the residue was dissolved in 100 mL methanol to achieve a concentration of 1 mg/mL. This solution was further processed as required for analysis.

**Procedure:** Aliquots of the standard CEFP solution (0.5-2.5 mL, 400 µg/mL) were placed into 25l mL graduated test tubes. 1 mL ($2.64 \times 10^{-4}$ M) haematoxylin, 1.0 mL ($7.04 \times 10^{-4}$ M) CAT and 15 mL buffer (pH 7) were delivered successively to each tube kept in boiling water bath for 5 min and cooled to room temperature and then diluted to the mark with distilled water. The absorbance was measured at 555 nm within 40 min against reagent blank and the amount of CEFP was calculated from its calibration graph.

## RESULTS AND DISCUSSION

The optimum conditions for this method were established by varying one parameter at a time and keeping the others fixed and observing the effect produced on the absorbance of the coloured species. Beer's law limits, molar extinction coefficient, Sandell's sensitivity and regression characteristics of the method are presented in Table-1. The relative standard deviation and % range of error are also given in Table-1. Recovery studies were carried out by addition of known standard drug solution to preanalyzed sample solution. Results of recovery studies were presented in Table-2.

The interference studies in the determination of CEFP in pharmaceutical formulation revealed that the normally existing excipients and additives like hydroxy propyl cellulose, lactose, carboxy methyl cellulose were found not to interference even when present in excess.

TABLE-1

| Parameter | Hae-CAT |
|---|---|
| $\lambda_{max}$ (nm) | 550 |
| Beer's law limits (µg/mL) | 8-48 |
| Detection limits (µg/mL) | 0.0797 |
| Molar absorptivity (1 $mol^{-1}$ $cm^{-1}$) | $0.0456 \times 10^6$ |
| Sandell's sensitivity (µg $cm^{-2}$/0.001 absorbance unit) | 0.0782 |
| Optimum photometric range (µg/mL) | 18-56 |
| Regression equation (Y = a + bx) | |
| Slope (b) | 0.0128 |
| Standard deviation on slope ($S_b$) | $1.0911 \times 10^{-5}$ |
| Intercept (a) | $-1.07 \times 10^{-3}$ |
| Standard deviation on intercept ($S_a$) | $3.994 \times 10^{-4}$ |
| Standard Error of Estimation ($S_e$) | $3.6515 \times 10^{-4}$ |
| Correlation co-efficient (r) | 0.99999 |
| Relative standard deviation (%)* | 0.1142 |
| % Range of error (confidence limits)* | |
| 0.05 level | 0.1695 |
| 0.01 level | 1.8341 |
| % Error in bulk samples** | 0.1352 |

TABLE-2

| Formulations (CEFP) | Labelled amount (mg) | Amount found (mg) by proposed methods* | Reference method | % Recovery by proposed methods** |
|---|---|---|---|---|
| Tablet 1 | 50 | 50.22 ± 0.25<br>F = 4.34<br>t = 0.8426 | 50.13±0.12 | 100.4±0.5 |
| Tablet 2 | 50 | 49.94 ± 0.50<br>F = 2.44<br>t = 0.5492 | 49.81±0.32 | 99.98±0.02 |
| Tablet 3 | 100 | 99.73 ± 0.65<br>F = 1.3473<br>t = 0.5111 | 99.55±0.56 | 99.55±0.55 |

*Tablets from four different pharmaceutical companies.
**Average ± standard deviation of six determinations, the t-and F-test values refer to comparison of the proposed method with the reference method. Theoretical values at 95 % confidence limit, F = 5.05, t = 2.57.

**Coloured species formation:** Chloramine-T (CAT) acts as a selective oxidizing agent in acid and alkaline media[16]. An excess of CAT was added to the analyte solution and allowed to react for a given time. The excess CAT present in the acidic medium was determined by titrimetry. But titrimetric procedures are not suitable for the determination of compounds at microgram levels. After completion of the reaction with analyte, the unreacted CAT can be determined using visible spectrophotometric method. The reacted CAT corresponds to the analyte haematoxylin when treated with CAT it undergoes oxidation to yield haematin[17,18]. In the present

investigation CEFP possess S: compound. The colour species formation may be attributed to the formation of charge transfer complex between *in situ* formed haematin from haematoxylin-CAT and S: portion in CEFP.

## Conclusion

The proposed method has higher $\lambda_{max}$ values and sensitivity. It is simple, rapid and have reasonable precision and accuracy. The method is useful for the determination of CEFP in pure state and pharmaceutical formulations.

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