

### SIMPLE UV SPECTROPHOTOMETRIC ASSAY OF CIPROFLOXACIN

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Received -25.09.2014; Reviewed and accepted -06.10.2014

#### ABSTRACT

**Objective:** Ciprofloxacin is an established broad-spectrum fluoroquinolone antibiotic displaying activity against both Gram-positive and Gram-negative bacteria pathogens. It acts principally by inhibiting DNA-gyrase and topoisomerase IV present in bacterial cells which are responsible for reproduction of DNA of bacteria. A rapid, simple, accurate, and economical least time consuming spectrophotometric method has been developed for the assay of Ciprofloxacin and then compare it with the assay of different brands available in Karachi, Pakistan. A sample of drug was dissolved in water to produce a stock solution containing ciprofloxacin. **Methods:** Samples of ground tablets of different brand were taken and their diluted solutions of 100ppm, 50ppm, 25ppm, 12.5ppm and 6.25ppm were prepared with the same solvent. The assay was determined by measuring the absorbance of stock solution against the solvent blank and comparing with the absorbance of available brands of ciprofloxacin at the wavelength of 278 nm by spectrophotometer. **Results:** The percent assay is calculated and the correlation coefficient for different brands was found to be 0.9998 for (A), 0.9992 for (B), 0.9996 for (C) and CYCIN (D), 0.9989 for (E) and 0.9986 for (F) which are within the limit. **Conclusion:** Thus we can conclude that the method can be applied for the routine QC quantitative analysis of ciprofloxacin in active and tablet formulation.

**Key Words:** Ciprofloxacin assay, regression equation, UV spectrophotometry

#### INTRODUCTION

Ciprofloxacin is an established broad-spectrum fluoroquinolone antibiotic displaying activity against both Gram-positive and Gram-negative bacteria pathogens [1, 2]. It acts principally by inhibiting DNA-gyrase and topoisomerase IV present in bacterial cells which are responsible for reproduction of DNA of bacteria [3]. It is particularly effective against *Pseudomonas aeruginosa*. In patients with cystic fibrosis and bronchiectasis, *P. aeruginosa* causes severe decline in lung function. Its oral and parenteral dosage forms indicated for the treatment of exacerbations of respiratory tract infection [4-7]. Ciprofloxacin is used in various clinical diseases such as infectious enteritis and inflammatory bowel disease, induction of nitric oxide, suppression of pro-inflammatory cytokines and moreover it is able to induce apoptosis in a variety of human cancer cell lines including the human colonic cancer cells [8]. Ciprofloxacin exists mainly as a zwitterions at physiological pH values of 7.4 with a shift toward the cationic form at pH 6.5. zwitterion likely to interact with organic anion as well as organic cation transporters in the renal tubular cells [2, 9]. In critically ill patients without renal impairment ciprofloxacin doses ranging from 200 mg (twice daily) to 400 mg (three times daily) have been used whereas in patients with severely impaired renal function dosage adjustment is advised i.e. a 50% dosage reduction has been recommended [10]. Ciprofloxacin oral absorption can be significantly reduced after concomitant administration of foods containing  $Ca^{2+}$  and  $Al^{3+}$  (divalent and trivalent cations) and milk. Ciprofloxacin-food interactions may affect both the rate and extent of absorption and predominantly lead to low therapeutic concentrations of ciprofloxacin and thus therapeutic failure [11].

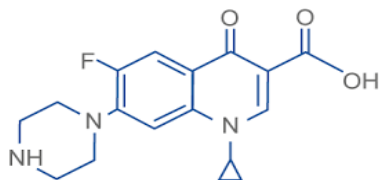


Figure 1: Structure of ciprofloxacin

#### EXPERIMENTAL

Measurement of spectra of ciprofloxacin UV visible 1601 Shimadzu double beam spectrophotometer was used and the solvent was water that was used for measuring the absorbance for the assay.

#### Wavelength Selection

Ciprofloxacin solution of about 200 ppm was accurately prepared in water. This solution was scanned in the 200-400 nm UV regions. The wavelength maximum ( $\lambda_{max}$ ) was observed at 278 nm and this wavelength was adopted for absorbance measurement.

#### Standard Stock solution

For standard stock solution accurately weighed 20 mg of ciprofloxacin and it transferred to a volumetric flask and add sufficient water to produce 100 ml.

#### Sample Preparation

The six different brands of ciprofloxacin i.e. Novidat Axcin Cyrocine Cycin Quinoflox Ciproxin were purchased from different pharmacies situated in Karachi, Pakistan. Ciprofloxacin tablets of each brand have same batch number and were labeled to contain ciprofloxacin 500 mg per tablet. Accurately weigh 20 tablets of each brand of ciprofloxacin and crushed uniformly with the help of a mortar and pestle. By calculating the average weight, weigh sample powder equivalent to 20 mg of ciprofloxacin and transferred into a volumetric flask and make up volume upto 100 ml with water.

#### Dilutions preparation

From the standard stock solution of different brands of ciprofloxacin i.e. Novidat, Axcin, Cyrocine, Cycin, Quinoflox and Ciproxin different dilutions are prepared. Five different dilutions of each brand of 100 ppm, 50 ppm, 25 ppm, 12.5ppm and 6.25ppm were prepared for each brand from 200ppm standard stock solution.

#### Procedure

After preparation of standard and sample solutions, measure the absorbance of standard solution (200 ppm in 100 ml) and different dilutions (100 ppm, 50 ppm, 25 ppm, 12.5 ppm and 6.25 ppm, all in 100 ml) in 1 cm cuvette by using UV-VIS spectrophotometer at the wavelength of maximum absorbance 278 nm, using the blank solution. Calculate the quantity in mg, of ciprofloxacin per tablet.

#### RESULTS AND DISCUSSION

The aim of the study was to carry out the pharmaceutical assay on different brands (NOVIDAT, AXCIN, CYROCIN, CYCIN, QUINOFLOX and CIPROXIN) of ciprofloxacin tablets by using spectrophotometer. Pharmaceutical company name, Brand

names, average wt of tablets, weight for 100ppm in 100 ml, absorbance table 1 and % assay are shown in table 1, 2 and figure 2. Five dilutions of 100ppm, 50ppm, 25ppm, 12.5ppm and 6.25ppm for each brand of ciprofloxacin were prepared. Their absorbance was taken to calculate the percentage assay, regression equation and to obtain the regression line to predict further availability of ciprofloxacin. The linearity was detected by preparing solution of 100ppm, 50ppm, 25ppm, 12.5ppm and 6.25ppm of each brand and absorbance were taken in triplicate manner at each level by spectrophotometric analysis. Concentration vs. absorbance at level of 100ppm, 50ppm, 25ppm, 12.5ppm and 6.25ppm were plotted on graph for linearity

detection shown in figure 3-8 which conclude that it obeys Beer's Lambert law i.e. absorbance is directly proportion to concentration. The squared correlation coefficient (should NLT 0.99) for different brands shown in table 4, it was found to be 0.9998 for NOVIDAT (A), 0.9992 for AXCIN (B), 0.9996 for CYROCIN(C) and CYCIN (D), 0.9989 for QUINOFLOX (E) and 0.9986 for CIPROXIN (F). Squared correlation coefficient values of all brands of ciprofloxacin are within the limit. we have done this type of assay for different drugs which are useful for pharmacist[12-23]

Table 1: Different brands of ciprofloxacin

Pharma	Brand Name	Average wt of tablet g	wt for 100 ppm in 100 ml	Absorbance at 278 nm	% assay
Sami	Novidat	0.7620	0.0152	0.125	100.00
Sandoze	Axcin	0.7693	0.0153	0.127	101.60
Highnoon	Cyrocin	0.8666	0.0173	0.178	142.40
Ildong	Cycin	0.772	0.0172	0.124	99.20
Bosh	Quinoflox	0.7529	0.0159	0.156	124.80
Bayer	Ciproxin	0.7643	0.0152	0.171	136.80

Table 2: Assay of different brands of ciprofloxacin

Brand Name	% Assay
Novidat	100
Axcin	101.6
Cyrocin	142.4
Cycin	99.2
Quinoflox	124.8
Ciproxin	136.8

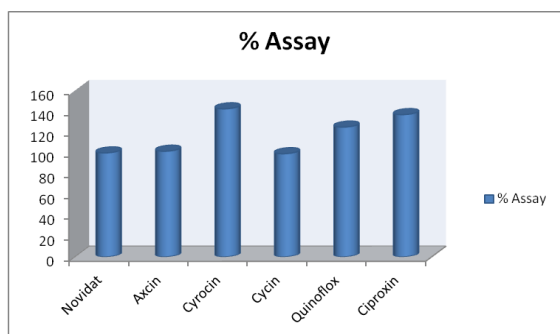


Fig. 2 :% Assay of different brands of ciprofloxacin

Table 3: Absorbance of different brands

Con.	A	B	C	D	E	F
100	0.125	0.127	0.178	0.156	0.16	0.171
50	0.0625	0.066	0.092	0.075	0.08	0.088
25	0.033	0.033	0.045	0.035	0.04	0.045
12.5	0.017	0.015	0.022	0.017	0.014	0.018
6.25	0.008	0.007	0.001	0.008	0.007	0.008

Table 4: Regression equations of different brands

Brands	Regression equations	R <sup>2</sup>
A	y = 0.0012x + 0.0011	0.9998
B	y = 0.0013x - 4E-05	0.9992
C	y = 0.0018x - 0.0038	0.9996
D	y = 0.0016x - 0.0032	0.9996
E	y = 0.0016x - 0.0035	0.9989
F	y = 0.0017x - 0.0014	0.9986

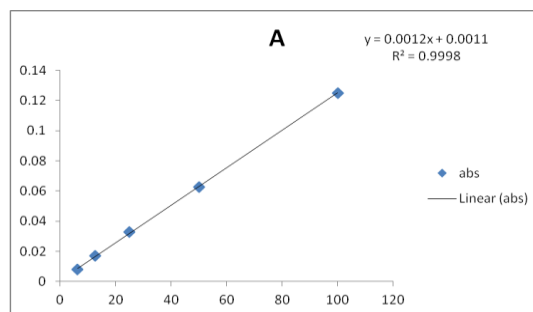


Figure 3: linearity plot for assay of different dilutions of Novidat,

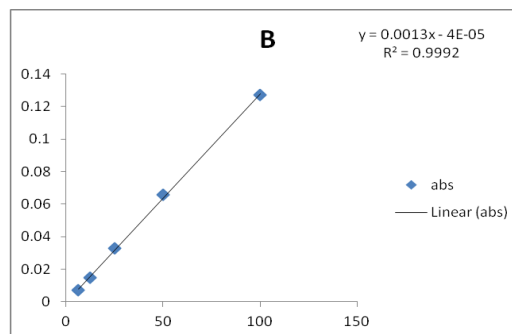


Figure 4: linearity plot for assay of different dilutions of Axcin

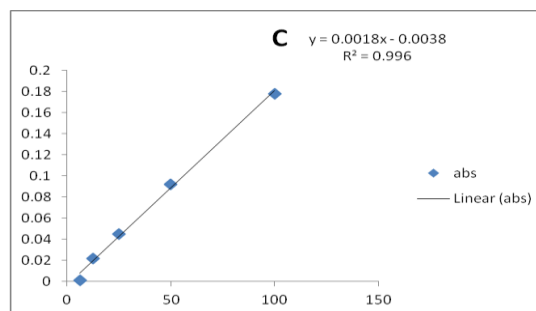


Figure 5: Linearity plot for assay of different dilutions of Cyrocin

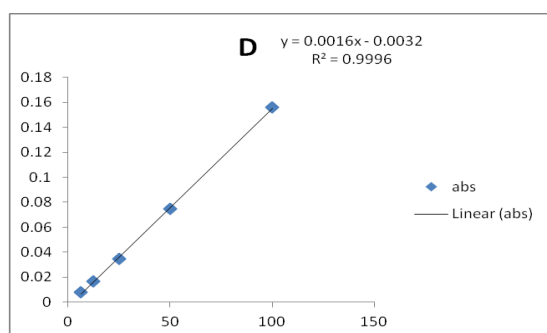


Figure 6: Linearity plot for assay of different dilutions of Cycin

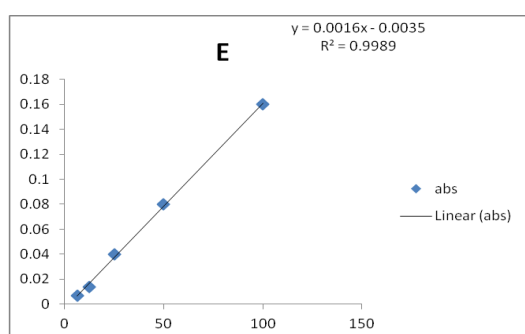


Figure 7: Linearity plot for assay of different dilutions of Quinoflox

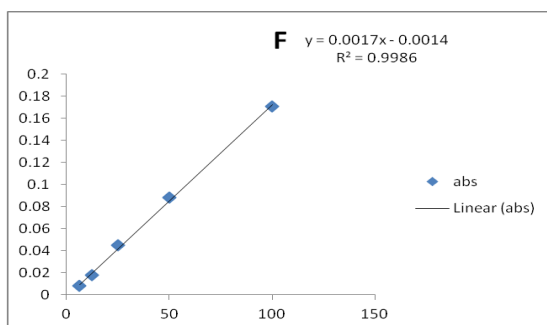


Figure 8 Linearity plot for assay of different dilutions of Ciproxin

## CONCLUSION

A good linear relationship was observed in the concentration ranges of 100ppm, 50ppm, 25ppm, 12.5ppm and 6.25ppm for different brands of ciprofloxacin tablets i.e. NOVIDAT, AXCIN, CYROCIN, CYCIN, and QUINOFLOX AND CIPROXIN. The correlation coefficient for different brands of ciprofloxacin was found to be 0.9998 for (A), 0.9992 for (B), 0.9996 for (C) and CYCIN (D), 0.9989 for (E) and 0.9986 for (F) which are within the limit.

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