

# Spectrophotometric Estimation of Azithromycin in Tablets

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Jayanna, *et al.*: Spectrophotometric Estimation of Azithromycin

The present manuscript describes a simple, sensitive, accurate, precise and economical visible spectrophotometric method for the estimation of azithromycin from tablet formulation. The method is based on the reduction of potassium permanganate in alkaline medium with azithromycin. The measurement of decrease in absorbance of potassium permanganate at 547 nm was done, as it decolourises upon reduction by azithromycin. The method was used to determine between 2 and 20 µg/ml of azithromycin in the final measured solution. There is no interference from the ingredients commonly found in azithromycin tablets with this method. The results for the determination of azithromycin in tablets were in good agreement with the labelled quantities and related analytical parameters are calculated.

**Key words:** Azithromycin, potassium permanganate, spectrophotometry, tablets

Azithromycin, chemically, (2R,3S,4R,5R,8R,10R,11R,12S,13S,14R)-2-ethyl-3,4,10-trihydroxy-3,5,6,8,10,12,14-heptamethyl-15-oxo-11-{[3,4,6-trideoxy-3-(dimethylamino)-β-D-xylo-]oxy}-1-oxa-6-azacyclopentadec-13-yl 2,6-dideoxy-3-C-methyl-3-O-methyl-α-L-ribo-hexopyranoside is a semisynthetic macrolide antibiotic widely used in the treatment of respiratory tract infections, such as pharyngitis, pneumonia, chronic bronchitis and bronchopneumonia. The most commonly used techniques for the determination of azithromycin in pharmaceutical dosage forms are high performance liquid chromatography<sup>[1,2]</sup>, liquid chromatography-mass spectrometry<sup>[3]</sup>, microbiological<sup>[4]</sup>, differential pulse voltammetric<sup>[5-7]</sup>, amperometric<sup>[8]</sup> diffuse reflectance near infrared spectroscopy<sup>[9]</sup> and spectrophotometric methods<sup>[10-14]</sup>.

However, chromatographic techniques require long experimental procedures for sample clean up and demand expensive equipment. In differential pulse voltammetric method, the adsorption of the drug on the electrode surface has not been sufficiently strong and hence it has not been analytically useful. Lakshmi<sup>[10]</sup> have reported a visible spectrophotometric method for the determination azithromycin in tablets is not specific. Most of the reported methods are highly sophisticated, costly and time-consuming.

The objective of the present work was to develop a simple spectrophotometric method for the determination of azithromycin in pharmaceutical formulations. The present procedure neither requires any extraction nor heating nor any elaborate equipment and the method is less time-consuming.

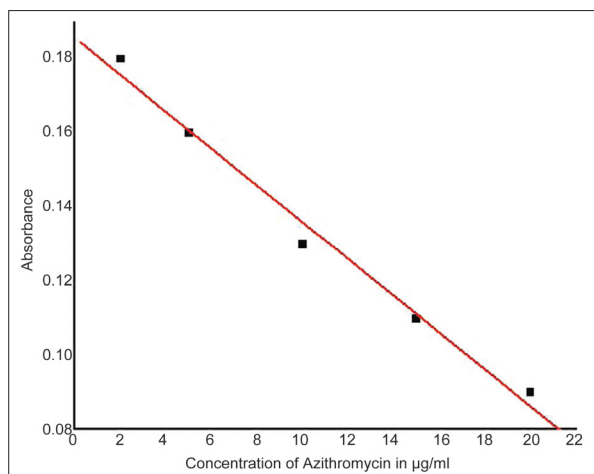
Azithromycin was kindly supplied by Max India's Pharmaceutical Division, Nanjanagud, Mysore. Azee (azithromycin; 500 mg/tablet and 50 mg/tablet) of Cipla Limited, Goa, India. Azid kid (Azithromycin; 100 mg/tablet) of Indi Pharma Pvt. Ltd., Mumbai, India and Aziwin (azithromycin; 100 mg/tablet) of Bal Pharma Ltd., Rudrapura, India were purchased from local market. Potassium permanganate and anhydrous potassium carbonate were procured from Glaxo Ltd., Mumbai, India and were of analytical grade. UV/Vis spectrophotometer with 10-mm matched quartz cells were used for absorbance measurement.

Standard stock solution of azithromycin (10 µg/ml) was prepared by accurately weighing and dissolving 10 mg of azithromycin in distilled water and diluted to 100 ml. Potassium permanganate (0.0012 mol/l) was prepared by dissolving 0.02 g of potassium permanganate in distilled water and diluted to 100 ml. Potassium carbonate (0.1 mol/l) was prepared by dissolving 1.3831 g of potassium permanganate in distilled water and diluted to 100 ml.

Aliquots of the standard azithromycin containing 2-20 µg/ml were transferred to a series of

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**Fig. 1: Calibration graph of azithromycin**  
Azithromycin+1.0 ml  $\text{KMnO}_4$ +1.0 ml  $\text{K}_2\text{CO}_3$ +diluted to 10 ml. The calibration curve for azithromycin was prepared and linear relationships between absorbance and concentration held over range of 2-20 µg/ml

10 ml volumetric flasks. To each one of these flasks, 1.0 ml potassium permanganate (0.01 M) followed by 1.0 ml of potassium carbonate were added. The volume was made up to 10 ml with water and mixed thoroughly. Absorbance of these solutions was measured at 547 nm after 30 min making zero absorbance with distilled water.

The calibration curve for azithromycin was prepared by the recommended procedure as shown in fig. 1. Linear relationships between absorbance and concentration held over a range of 2-20 µg/ml and other parameters are given in Table 1.

No interference was observed from the presence of starch, lactose and most commonly used tablet excipients. For analysis of the formulation, 10 tablets of Azithromycin were weighed accurately and average weight per tablets was determined. The tablets were powdered and powder equivalent to 10 mg was weighed accurately and dissolved in water. The residue was filtered through Whatman Filter Paper No. 41 into a 100 ml volumetric flask. The residue was washed with distilled water and washings were added to the filtrate. Final volume of filtrate was made up to the mark with distilled water and was analysed according to the recommended procedure. Results were in good agreement with the label claim of the drug. The amount and relative standard deviation (RSD) (%) for the drugs azee of 500 mg and 250 mg, Azid Kid 100 mg and aziwin 100 mg and 250 mg were found to be 500.05, 0.15 and

**TABLE 1: OPTICAL CHARACTERISTICS OF THE PROPOSED PROCEDURE**

Parameters	Azithromycin
$\lambda_{\text{max}}$ , nm	547
Beer's limit (µg/ml)	2-20
Molar absorptivity (l/mol/cm)	$2.1994 \times 10^4$
Sandell's sensitivity (µg/cm <sup>2</sup> /0.001 A)	0.03405
Correlation coefficient	-0.99343
Regression equation	
Slope (b)	-0.00496
Intercept (a)	0.1856
Coefficient of variance (10 µg/ml of Azithromycin)	0.64 (N=5)
Relative standard deviation (%)	0.612

Optical characteristics for azithromycin such as Beer's law, molar absorptivity and sandell's sensitivity are shown

250.25, 0.30, 100.6, 0.54, and 100.0, 0.70 and 250.12, 0.34, respectively.

The method is based on the reduction of potassium permanganate in alkaline medium with azithromycin. Permanganate decolourises as it is reduced quantitatively to manganese dioxide in alkaline solution. The colour is stable for about 1 h. The result of the analysis of tablet formulation by the proposed method is reproducible, reliable and in good agreement with the label claim of the drug. Method was validated and found to be simple, sensitive, accurate and precise. The excipients present in the tablet dosage form did not interfere with determination of azithromycin. Hence, this method can be used successfully for the routine analysis of azithromycin in tablet formulation.

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