

## Development of new spectrophotometric methods for the determination of Alfuzosin hydrochloride in bulk and pharmaceutical formulations

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### ABSTRACT

Two simple and sensitive methods A and B for the spectrophotometric determination of Alfuzosin hydrochloride have been described. These methods are based on the formation of purple color and red- violet colored chromogens obtained when the drug was diazotized with nitrous acid followed by coupling with Phloroglucinol and Resorcinol, exhibiting  $\lambda_{\max}$  at 520 and 600 nm respectively. These methods obey Beer's law in the concentration ranges of 4-20 and 2-10  $\mu\text{g/mL}$ . These methods are highly reproducible and have been applied to a wide variety of pharmaceutical preparations.

**Key words:** Alfuzosin hydrochloride, chromogen, spectrophotometry.

### INTRODUCTION

Alfuzosin hydrochloride is an  $\alpha_1$ -adrenoreceptor blocker. It is used in the symptomatic treatment of urinary obstruction caused by benign prostatic hyperplasia and has been tried in the treatment of hypertension. Alfuzosin hydrochloride is chemically designated as N-{3-[(4-Amino-6, 7-dimethoxyquinazolin-2-yl) (methyl) amino] propyl} tetrahydro-2-furamide hydrochloride<sup>1</sup>. Few analytical methods have been reported for the determination of Alfuzosin hydrochloride in pharmaceuticals and biological fluids. Alfuzosin hydrochloride was determined in human plasma by HPLC-tandem mass spectrometry<sup>2</sup>, chiral mobile phase HPLC for chiral separation of three new enantiomers of Alfuzosin, Doxazosin and Terazosin<sup>3</sup> and HPLC methods using fluorescence detection<sup>4-8</sup> and ion-pair complex formation Spectrophotometric techniques<sup>9</sup>.

The present paper describes two simple, sensitive, selective, and economical validated visible spectrophotometric methods for the assay of Alfuzosin hydrochloride in drug formulations through diazo coupling reactions.

### MATERIAL AND METHODS

#### Apparatus

All spectral measurements were made on ELICO SL 159 double beam, UV-visible spectrophotometer with 1 cm quartz cells was used for all absorbance measurements.

#### Reagents and chemicals

##### All chemicals used were of analytical grade

Aqueous solutions of sodium nitrite (0.1% w/v), Aqueous solutions of Sodium hydroxide (4% w/v) Dilute hydrochloric acid (0.25M) were freshly prepared.

**Standard stock solution**

Alfuzosin hydrochloride (pure form)(100mg) was accurately weighed and dissolved in 20ml of distilled water, transferred to a standard 100ml volumetric flask. The final volume was made up to the mark with distilled water. The final concentration was brought to 100µg/mL with distilled water.

**Procedure for the assay of alfuzosin hydrochloride in pharmaceutical formulations**

Twenty tablets containing Alfuzosin hydrochloride were weighed and finely powdered. An accurately weighed portion of the powder equivalent to 25mg of AFZ was dissolved in a 25ml of methanol and mixed for about 5 minutes and then filtered. The methanol was evaporated to

dryness. The remaining portion of solution was diluted in a 25ml volumetric flask to the volume with distilled water. The general procedure was then followed in the concentration ranges mentioned above.

**Recommended procedures for the determination of alfuzosin hydrochloride****Method A**

Aliquots of (0.5-2.5ml) Alfuzosin hydrochloride (0.5ml =100µg) were transferred into a series of 25ml volumetric flasks. To each of the above aliquots, hydrochloric acid (dilute) (1.0ml) and 1.0ml cold aqueous solution of sodium nitrite (0.1% w/v) were added and set aside for 10 min at 0-5°C temperature. Later 1.0ml of Phloroglucinol

**Table 1: Optical characteristics and precision**

Optical Characteristics	Method A	Method B
λ max (run)	520	600
Beer's law limits(µg/mL)(C)	4 - 20	2 - 10
Molar absorptivity (lit.mol <sup>-1</sup> cm <sup>-1</sup> )	7.70×10 <sup>3</sup>	2.59×10 <sup>4</sup>
Sandell's sensitivity (µg/cm <sup>2</sup> )-0.001 ab units	0.1456	0.0643
Regression equation(Y = a + bc) <sup>*</sup>		
Slope (b)	0.0178	0.0606
Intercept ( a)	0.0023	0.0017
Correlation coefficient (r)	0.9998	0.9999
% RSD	0.9159	0.3845
Range of errors <sup>**</sup>		
Confidence limits with 0.05 level	0.9616	0.4037
Confidence limits with 0.01 level	1.5079	0.6331

\*Y is the absorbance and C is the concentration µg/mL

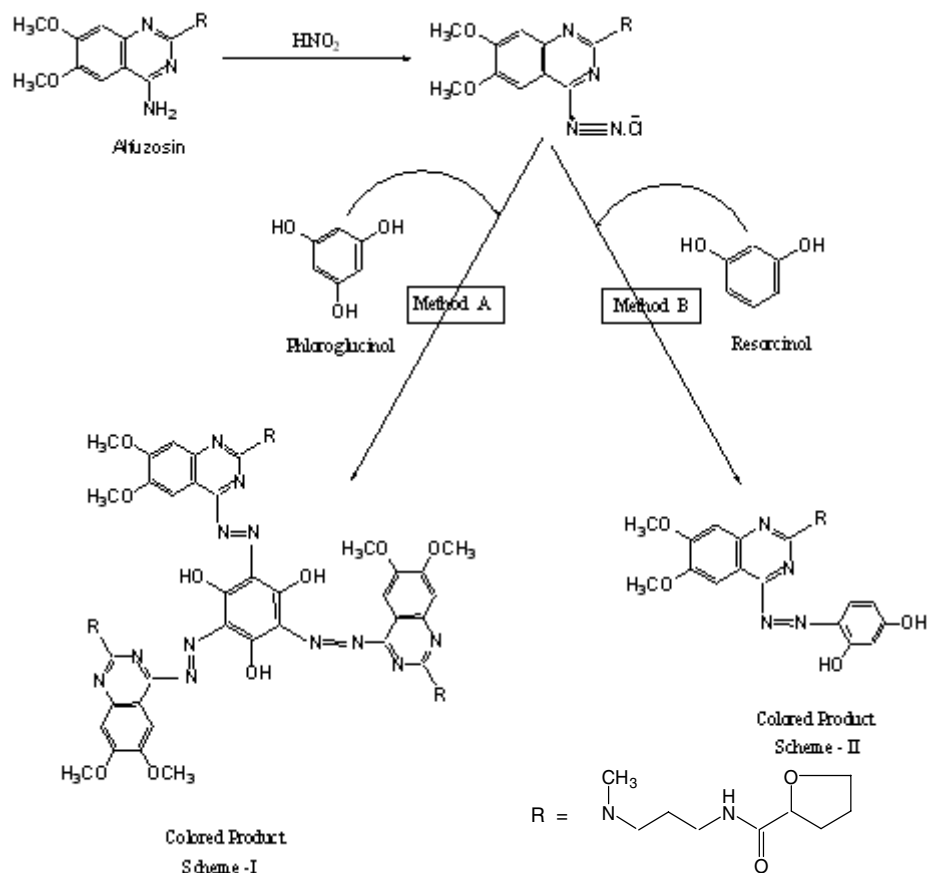
\*\*For six measurements

**Table 2: Estimation of alfuzosin hydrochloride in pharmaceutical formulations**

Sample	Labelled amount (mg)	Amount obtained (mg) Proposed methods <sup>**</sup>		UV method	%Recovery of Proposed methods <sup>*</sup>	
		MethodA	MethodB		MethodA	MethodB
Tablet - 1	2.5	2.47	2.46	2.48	99.59	99.19
Tablet - 2	5.0	4.94	4.95	4.98	99.19	99.39
Tablet - 3	10.0	9.96	9.94	9.97	99.89	99.69

\*Average of six determinations

\*\* Mean and standard deviation of six determinations



(0.1% w/v) and 1.5ml of aqueous Sodium hydroxide (4% w/v) were added successively, and then the volume in each tube was made up to 25ml with distilled water. The absorbance was measured at 520nm against reagent blank. The amount of Alfuzosin hydrochloride was computed from calibration curve. The color was found to be stable for more than 2 hours at room temperature. The concentration of Alfuzosin hydrochloride was calculated either from calibration curve or from regression equation.

#### Method B

Aliquots of (0.5-2.5ml) Alfuzosin hydrochloride (1ml =100 $\mu\text{g}$ ) were transferred into a series of 25ml volumetric flasks. To each of the above aliquots, hydrochloric acid (dilute) (1.0ml) and 1.0ml cold aqueous solution of sodium nitrite (0.1% w/v) were added and set aside for 10 min at 0-5 $^\circ\text{C}$  temperature. Later 1.0ml of Resorcinol (0.1%

w/v) and 1.5ml of aqueous Sodium hydroxide (4% w/v) were added successively, and then the volume in each tube was made up to 25ml with distilled water. The absorbance was measured at 600nm against reagent blank. The amount of Alfuzosin hydrochloride was computed from calibration curve. The color was found to be stable for more than 4 hours at room temperature. A calibration graph was drawn and the corresponding regression equation was computed to obtain the concentration of Alfuzosin hydrochloride.

#### RESULTS AND DISCUSSION

The presence of amino group in Alfuzosin hydrochloride enabled the use of diazotization of the drug with nitrous acid and coupling the resulting diazonium salt with Phloroglucinol, to form purple colored chromogen in method A (Scheme 1) exhibiting  $\lambda_{\text{max}}$  at 520nm. In method B (Scheme 2)

same diozotization reaction was followed by coupling with Resorcinol in presence of sodium hydroxide solution resulting in the formation of red-violet chromogens exhibiting  $\lambda_{\text{max}}$  at 600nm. The Beer's law was obeyed by these two methods in the concentration ranges 4 - 20 and 2-10  $\mu\text{g/mL}$  respectively. The optical characteristics such as Beer's law limits, absorption maxima, molar absorptivity, Sandell's sensitivity, percent relative standard deviation (%RSD) calculated from six measurements containing  $\frac{3}{4}$ th of the amount of the upper Beer's law limits of Alfuzosin hydrochloride and percent range of errors (0.05 level and 0.01 confidence limits) were calculated for the two methods are reported in Table 1.

The optimum conditions for the color development in method A and method B were established by varying the parameters one at a time and keeping the other parameters fixed while observing the effects on the absorbance of colored species. The optimum concentration for the estimation of Alfuzosin hydrochloride was established by varying the drug concentration, keeping reagent concentration fixed. After establishing the optimum concentration for the drug, the reagent concentration was varied. The above ranges of drug and reagent concentrations were chosen because the colored species formed gave better absorbance and obeyed Beer's law. The values obtained for the determination of Alfuzosin hydrochloride in different brands of Tablet samples 1, 2 and 3 by the proposed and U.V methods, are

compared in Table 2. To evaluate the validity and reproducibility of the methods, known amounts of pure drug were added to the previously analyzed pharmaceutical preparation and the mixtures were analyzed by the proposed methods. The percent recoveries are given in Table 2.

The methods reported here are found to be simple, sensitive, accurate and precise. The reaction occurs at 0-5° C temperature and no extractions procedure is involved as compared with other established methods. Further, spectrophotometric methods involve simple instrumentation which is cost effective compared with other instrumental techniques, which ordinary laboratories cannot afford to have. The present methods involve the formation of highly stable colored species which makes it easier for the determination of Alfuzosin hydrochloride from pharmaceutical dosage forms in a routine manner.

These studies revealed that the common excipients usually present in the tablet form, did not interfere at their regularly added levels.

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