Asian Journal of Chemistry Vol. 20, No. 3 (2008), 1781-1785

Spectrophotometric Determination of Rosiglitazone Maleate in Tablets

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Two new, simple and sensitive spectrophotometric methods in ultraviolet and visible region, respectively have been developed for the determination of rosiglitazone maleate in bulk and in tablets. In method I rosiglitazone showed absorption maxima at 248.5 nm in methanol and obeyed beer's law in the concentration range of 2-20 µg/mL. In method II rosiglitazone maleate reacted with diazotized sulphanillic acid in an alkaline medium to form yellowish orange chromogen. Chromogen obeyed Beer's law in the concentration range of 10-60 µg/mL at λ_{max} of 475.7 nm. Statistical analysis and recovery studies validated the methods.

Key Words: UV-Visible spectrophotometer, Rosiglitazone, Estimation.

INTRODUCTION

Rosiglitazone maleate is chemically (±)-5-{-*p*-[2-(methyl-2-pyridylamino)ethoxy]benzyl}-2,4-thiazolidinedione. It is selective agonist for paroxisome proliferator-activated receptor gamma (ppar-γ)[1]. Literature survey revealed that several methods including reverse phase liquid chromatography[2] and HPLC[3,4] have been reported for the estimation of rosiglitazone. There is no UV-Visible spectrophotometric method for the estimation of rosiglitazone. Therefore we developed two simple and sensitive spectrophotometric methods for the estimation of rosiglitazone in tablets.

EXPERIMENTAL

A GBC Cintra-10 double beam UV-Visible spectrophotometer (Australia) equipped with 10 mm matched quartz cells was used in the present investigation. Methanol AR grade (Qualigens, Mumbai) was used in the present study. Pure rosiglitazone as gift sample was obtained from M/s Aristo Pharmaceuticals Ltd., Mumbai. All other chemicals used were of analytical grade.

Preparation of standard stock solution (Method I): Rosiglitazone maleate was accurately weighed and dissolved in methanol to get 1000 µg/mL of stock solution. Different aliquots (0.2, 0.4……2.0 mL) were taken from stock solution and diluted with methanol to prepare a series of concentration between 2-20 µg/mL. A solution of rosiglitazone maleate (10 µg/mL) showed λ_{max} at 248.5 nm and this λ_{max} was used to plot calibration curve (Fig. 1).

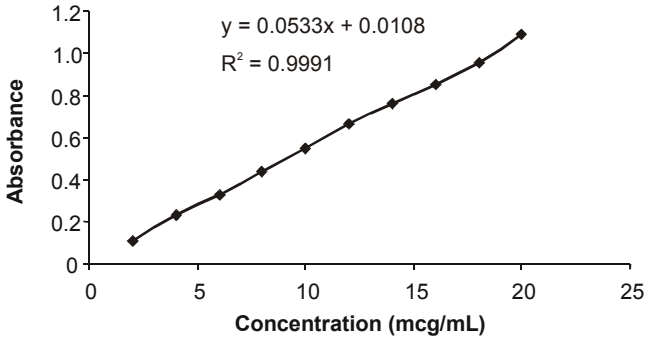

Fig. 1. Calibration curve of rosiglitazone maleate in methanol (Method I)

Preparation of sample stock solution (Method I): Two commercial formulations, Enselin 2 (M/s Torrent Pharmaceuticals Ltd.) and Rezult 2 (M/s Sun Pharmaceuticals Ltd.) were purchased from local market. The average weight of each tablet was calculated by weighing 20 tablets. Tablets were powdered finely in a glass mortar. The tablet powder equivalent to 10 mg of rosiglitazone maleate was accurately weighed and extracted with 4 successive 20 mL portions of methanol and transferred quantitatively into 100 mL volumetric flask after filtering through Whatman filter paper. The required volume was made up with methanol.

Estimation of marketed preparation (Method I): The above tablet powder solution was then suitably diluted to obtain concentration range of 2-20 µg/mL of rosiglitazone. Absorbances were taken and concentrations of rosiglitazone determined using the calibration curve. Finally calculations were made with the dilution factor to find out the concentration of the drug in tablets. The experiments were repeated six times to check its reproducibility.

Preparation of standard stock solution (Method II): Rosiglitazone maleate was accurately weighed and dissolved in 0.2 N sulphuric acid to make a final concentration of 1000 µg/mL as a stock solution. Different aliquots (10, 20……60 mL) were taken from stock solution and diluted with 0.2 N sulphuric acid to prepare a series of concentration between 10-60 µg/mL. A solution of 10 to 20 µg/mL showed λ_{max} at 475.7 nm. Calibration curve of rosiglitazone maleate was plotted at 475.7 nm using reagent blank (Fig. 2).

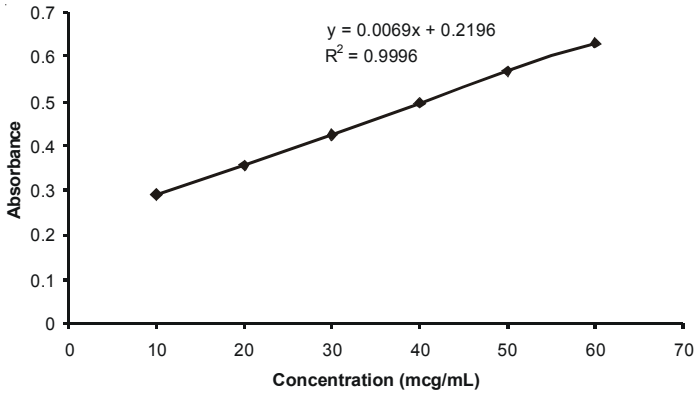

Fig. 2. Calibration curve of rosiglitazone maleate in methanol (Method II)

In this method, 1.0 mL sulphanillic acid solution (1 % w/v) was taken in a series of 10 mL volumetric flask. To each of these flasks 1.0 mL of sodium nitrite solution (0.5 % w/v) was added and contents were mixed and allowed to stand for 20 min (Solution I). In another set of 10 mL volumetric flask aliquots of rosiglitazone maleate ranging from 1-6 mL (100 µg/mL) were taken and 2.0 mL sodium hydroxide solution (6.0 % w/v) was added to each flask (Solution II). Then solution I was added to solution II and volume was adjusted with sodium hydroxide solution (6.0 % w/v) to give the final concentration of 10, 20, 30, 40, 50 and 60 µg/mL of rosiglitazone. The contents were heated on a boiling water bath for 20 min and cooled to room temperature. The absorbance was measured at 475.7 nm against a reagent blank for each solution and calibration curve was plotted.

Preparation of sample stock solution (Method II): Two commercial formulations, Enselin 2 (M/s Torrent Pharmaceuticals Ltd.) and Rezult 2 (M/s Sun Pharmaceuticals Ltd.) were purchased from local market. The average weight of each tablet was calculated by weighing 20 tablets. Tablets were powdered finely and powder equivalent to 100 mg of rosiglitazone maleate was accurately weighed. The powder was extracted with 4 successive 20 mL portions of methanol and transferred quantitatively into 100 mL volumetric flask after filtering through Whatman filter paper. The required volume was made up with methanol. Solution was then filtered and solvent evaporated. The residue was dissolved in 0.2 N sulphuric acid to give final concentration of 1000 µg/mL.

Estimation of marketed preparation (Method II): Aliquots of this solution were treated similar to standard as given above. The above tablet powder solution was then suitably diluted to obtain concentration range of 10-60 µg/mL of rosiglitazone maleate. Absorbances were taken and concentrations of rosiglitazone maleate determined using the calibration curve.

Finally calculations were made with the dilution factor to find out the concentration of the drug in tablets. The experiments were repeated six times to check its reproducibility.

To evaluate the validity and reproducibility of the method, recovery studies were carried out by adding known amount of pure drug to the analyzed sample of tablet powder and the mixture was reanalyzed for the drug content using the proposed method (Table-2).

RESULTS AND DISCUSSION

Method I and Method II for determination of rosiglitazone maleate showed molar absorptivity of 2.5948×10^4 and 7.52×10^3 L/mol cm, respectively. Linear regression of absorbance on concentration gave the equation $y = 0.0533x + 0.0108$ with a correlation coefficient (r) of 0.9991 for method I and $y = 0.0069x + 0.2196$ with a correlation coefficient (r) of 0.9996 for method II (Table-1). Statistical analysis of commercial formulations, for both of the methods is presented in Table-2.

TABLE-1
OPTICAL CHARACTERISTICS AND REGRESSION ANALYSIS OF ROSIGLITAZONE MALEATE

Parameters	Method I	Method II
λ_{max} (nm)	248.5	475.7
Beer's law limit (µg/mL)	2-20	10-60
Molar absorptivity (L/mol cm)*	2.5948×10^4	7.5200×10^3
Sandell's sensitivity (µg/cm^2 × 0.001 absorbance unit)	0.0182	0.0629
Regression equation	$y = 0.0533x + 0.0108$	$y = 0.0069x + 0.2196$
Slope (a)	0.0533	0.0069
Intercept (b)	0.0108	0.2196
Correlation coefficient (r)	0.9991	0.9996

*Average of six determinations.

The results of analysis of commercial formulation significantly showed low values of standard deviation, standard error and coefficient of variation and thus indicate the precision of the method. These values are compared with the theoretical values of 100 per cent by means of unpaired students't' test (Table-2). As the calculated 't' values were less than the theoretical 't' values, it is calculated that the results of analysis were in good agreement for each tablet. To test the accuracy and reproducibility of the proposed method, recovery experiments were performed. The percentage recovery was close to 100 % for both methods. The results are summarized in Table-3. The recovery experiments indicated the absence of interference

TABLE-2
STATISTICAL ANALYSIS OF ROSIGLITAZONE MALEATE

Brand name	Label claim (mg/tab)		Amount found (mg/tab)*		SD*	
	Method		Method		Method	
	I	II	I	II	I	II
ENSELIN 2	2.0	2.0	2.0009	2.0022	0.0129	0.0060
REZULT 2	2.0	2.0	1.9989	2.0054	0.0153	0.0171
	COV*		SE*		't'cal*	
	Method		Method		Method	
	I	II	I	II	I	II
ENSELIN 2	0.64	0.30	0.0053	0.0025	0.19	0.89
REZULT 2	0.76	0.85	0.0062	0.0069	0.16	0.77

*Average of six determinations. Theoretical 't' values at 95 % confidence level for (n-1) degree of freedom 't'(0.1, 5) = 2.571 and 1.476 for method I and method II, respectively. SD is standard deviation, COV is coefficient of variance and SE is the standard error.

TABLE-3
RECOVERY STUDIES OF ROSIGLITAZONE MALEATE

Brand name	%Recovery ± SD	
	Method I	Method II
ENSELIN 2	100.73±0.0171	99.32 ± 0.0026
REZULT 2	101.21±0.0124	101.86 ± 0.0080

*Average of six determinations; SD = standard deviation.

from the commonly encountered pharmaceutical additives and excipients (Table-2). The reproducibility, repeatability and accuracy of these methods was found to be good, which is evidenced by low standard deviation.

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(*Received*: 9 January 2007; *Accepted*: 24 October 2007) AJC-6041