Academic Sciences International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 4, Issue 2, 2012

Research Article

DERIVATIVE SPECTROPHOTOMETRIC DETERMINATION OF ROSIGLITAZONE MALEATE IN BULK DRUG AND PHARMACEUTICAL FORMULATION

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Received: 18 Oct 2011, Revised and Accepted: 11 Dec 2011

ABSTRACT

A simple derivative method with reliable, sensitive and reproducible UV Spectroscopic results have been developed for the estimation of RosiglitazoneMaleate in bulk and tablet formulation.A Shimadzu 1700 UV-Visible spectrophotometer with 1cm matched quartz cells and 0.1 N NaOH as solvent were employed in both the methods.First method is Zero order UV spectrophotometric method, which is based on the measurement of absorbance at 245nm and second method is the derivative spectrophotometric method in which derivative amplitude was measured at 218nm. The correlation coefficient for first and second method were 0.99992 and 0.99995 respectively.%Recovery from pharmaceutical formulation were 99.577 and 100.33 for first and second method respectively. The assay results by the proposed methods were in good agreement with label claim. The methods were validated statistically and by recovery studies.The proposed method can be used for routine QC analysis.

Keywords: UV Spectrophotometry, Derivative spectroscopy, Rosiglitazone Maleate, Pharmaceutical formulation

INTRODUCTION

Rosiglitazone is an antidiabetic drug in the thiazolidinedione class of drugs .Some reports have found rosiglitazone is associated with an increased risk of heart attacks, but other reports have not found a statistically significant increase. Concern about adverse effects has reduced the use of rosiglitazone despite its sustained effects on glycemic control [1].They reduce glucose, fatty acid, and insulin blood concentrations. They work by binding to the peroxisome proliferator-activated receptors (PPARs). PPARs are receptors on the membrane of the cell nucleus. Thiazolidinediones enter the cell, bind to the nuclear receptors, and affect the expression of DNA. Rosiglitazone is a selective ligand of PPARγ and has no PPARα-binding action. Other drugs bind to PPARα.[2]. Rosiglitazone also appears to have an anti-inflammatory effect in addition to its effect on insulin resistance. Nuclear factor kappa-B (NF-κB) is a signaling molecule which stimulates the inflammatory pathways. NF-κB inhibitor (IκB) is an inhibitor which downregulates the inflammatory pathways. When patients take rosiglitazone, NF-κB levels fall and IκB levels increase[3].Rosiglitazone may also benefit patients with Alzheimer's disease who do not express the ApoE4 allele[4] This is the subject of a clinical trial currently underway[5].Rosiglitazone may also treat mild to moderate ulcerative colitis, due to its anti-inflammatory properties as a PPAR ligand[6].A clinical trial has suggested these agents may be of use in treating malaria[7]The objective of this investigation was to device a simple, precise, rapid and economical method for the estimation of Rosiglitazone Maleate in bulk drug and in the tablet formulation.

MATERIALS AND METHOD

Rosiglitazone maleate was kindly supplied by R&D Dept. of Actavis pharmaceuticals LTD, Indrad, Dist.Mehsana (Gujarat) as gift sample. Tablets of one brand that procured from the local market were analyzed by the proposed method. In this method, the tablets were crushed and dissolved in 0.1N NaOH and diluted further. Sufficient amounts of the samples were withdrawn and their absorbencies were noted at 245 nm against reagent blank.

Shimadzu 1700 U.V visible spectrophotometer with 1cm matched quartz cells, and 0.1N NaOH was used as a solvent for the experiment.

Experimental

Rosiglitazone Maleate Stock Solution

An accurately weighed quantity of about 10mg of Rosiglitazone Maleate was taken in 100ml volumetric flask. Dissolved in sufficient quantity of 0.1N NaOH, sonicated and diluted to100ml with the same so as to get the concentration of 100µg/ml.

Sample solution of pharmaceutical formulation (tablet)

Twenty tablets of Rosiglitazone Maleate were weighed and powdered in glass mortar. Amount equivalent to 10 mg of Rosiglitazone Maleate was transferred to 100 ml volumetric flask, dissolved in sufficient quantity of 0.1N NaOH, sonicated and made up the volume with 0.1N NaOH to obtain concentration of 100µg/ml. This solution was then filtered through Whatmann filter paper # 41. Further dilutions were made from this stock solution to get required concentration.

Aliquots of 0.4 to 4 ml portions of standard solution of both pure drug and tablet were transferred to a series of 10 ml volumetric flask and volume in each volumetric flask was adjusted to 10 ml with solvent. The absorbance of solutions was measured at required wavelength against reagent blank and calibration curve was constructed.

Zero order spectroscopic method[8]

Determination of λ_{max}

The standard solution of Rosiglitazone Maleate (50µg/ml) was scanned at different concentrations in the range of 200-400nm and the λ_{max} was found to be 245nm against reagent blank.(Fig. 1)

Calibration curve for Rosiglitazone Maleate

The absorbances were recorded for 4-40µg/ml at 245nm (λ_{max}). From this calibration curve was plotted.(Fig. 2)

First order derivative method

Determination of λ_{max}

The standard solution of Rosiglitazone Maleate (50µg/ml) was scanned at different concentrations in the range of 200-400nm and the first order derivative spectra showed a sharp peak at 218.0 nm against reagent blank. (Fig. 3)

Calibration Curve for Rosiglitazone Maleate

The absorbencies were recorded for 04-40µg/ml at 218nm in derivative mode. From this calibration curve was plotted. (Fig. 4)

Method validation[9]

Specificity- Pure Rosiglitazone Maleate is spiked with common excipients and was assayed by proposed method and it was found

that the assay results were unaffected by the presence of such excipients.

Linearity- Linearity was observed in the range of 04-40µg/ml for zero order and 08-40µg/ml for first order derivative. The calibration curve yielded coefficient of correlation (r) 0.99992, 0.99995 for zero order and first order derivative methods respectively.

Sensitivity- High Molar absorptivity and low Sandell's sensitivity for the respective method reveals that all these methods are highly sensitive.

System precision- % COV calculated from 6 replicate readings (absorbance values) at concentration (20µg/ml) confirms the precision of the method.

Assay results- One brand of Rosiglitazone maleate tablets were analyzed by proposed methods, the percentage in tablet were determined. Assay results obtained are within limit.

Accuracy- The low values of S.D and %COV≤ 2 indicate that method is precise. % recovery was found to be within limit indicates the accuracy of methods.

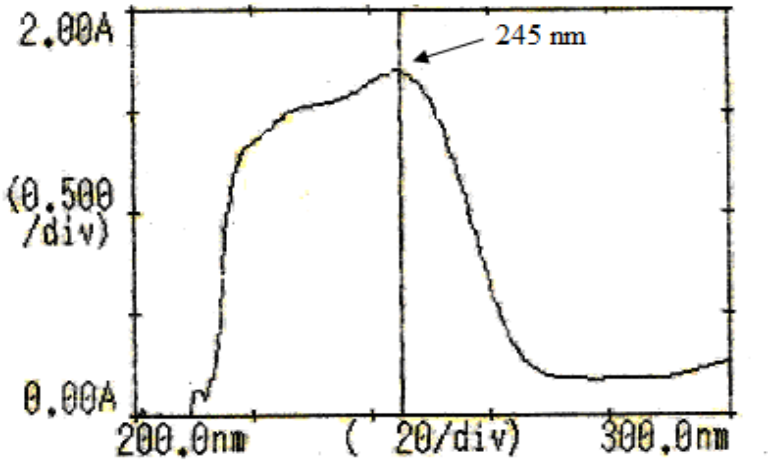

Fig. 1: λ_{max} of Rosiglitazone Maleate

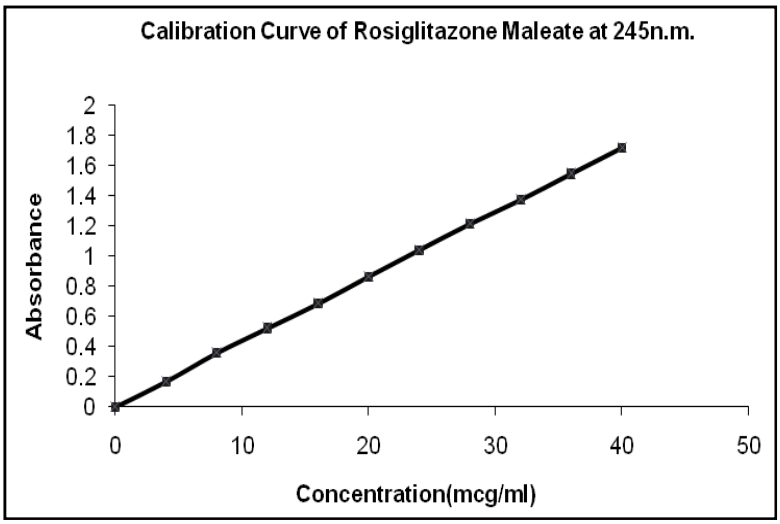

Fig. 2: Calibration Curve for Rosiglitazone Maleate

Table 1: Optical Characteristics and Precision

Parameters	Values
Absorption maxima (nm)	245
Beer's law limit (µg/ml)	04-40
Correlation coefficient (r^2)	0.99992
Molar absorptivity (lit/mole/cm)	2.0315×10^4
Sandell's sensitivity(mcg/sqcm/0.001)	0.023308
Slope (m)	0.042903
Intercept	0.005733
% COV	0.535
Standard error	0.00189
LOD(µg/ml))	0.35
LOQ(µg/ml)	1.0

Following are the parameters obtained during the procedure.

Table 2: Results of analysis of Rosiglitazone Maleate in tablet formulation

Sr.No	Tablet	Label claim (mg/tab)	Estimated (mg/tab)	% Estimated	%Recovery*
1	Enselin-4	4	3.98	99.50	99.577

Table 3: Statistical analysis of results

Sr. No	Tablet	SD	COV (%)	SE
1	Enselin-4	0.205	0.2059	0.1184

* Mean of six readings

SD-Standard deviation, COV-Coefficient of Variation, SE- Standard Error.

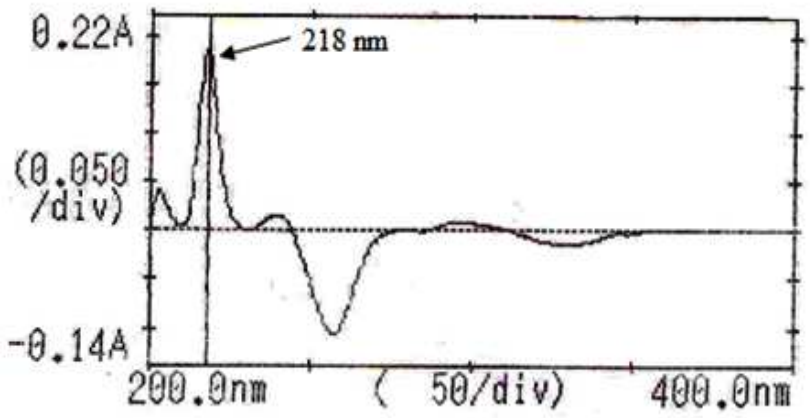

Fig. 3: First Order Derivative Spectra of Rosiglitazone maleate

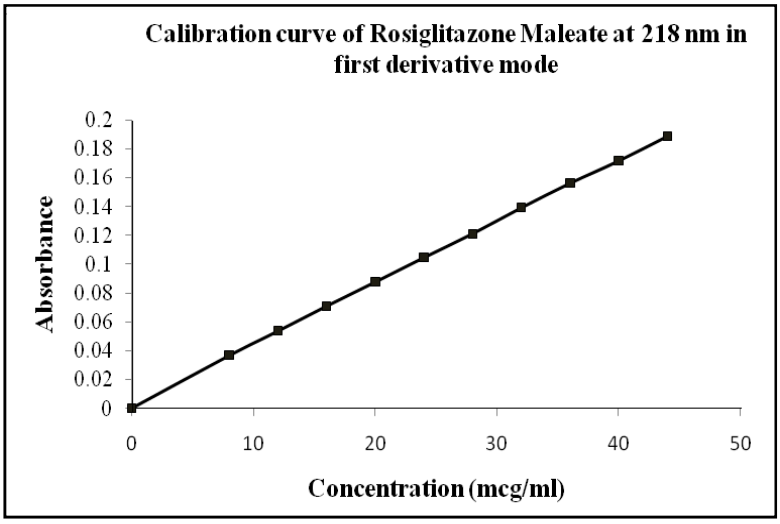

Fig. 4: Calibration Curve for Rosiglitazone maleate

Table 4: Optical Characteristics and Precision

Parameters	Values
Absorption maxima (nm)	218
Beer's law limit (mcg/ml)	08-40
Correlation coefficient (r^2)	0.99995
Molar absorptivity (lit/mole/cm)	0.20025×10^4
Sand ell's sensitivity(mcg/sqcm/0.001)	0.2365
Slope (m)	0.00423
Intercept	0.00293
% COV	0.414
Standard Error	0.000176
LOD(µg/ml)	0.40
LOQ(µg/ml)	1.0

Table 5: Results of analysis

S. No	Tablet	Label claim (mg/tab)	Estimated (mg/tab)	% Estimated	% Recovery*
1	Enselin-4	4	3.95	98.75	100.33

Table 6: Statistical analysis of results

S. No	Tablet	SD*	COV (%)*	SE*
1	Enselin-4	0.7570	0.7545	0.3090

* Mean of six readings

SD-Standard deviation, COV-Coefficient of Variation, SE- Standard Error

RESULTS AND DISCUSSION

All the methods, Zero order and First order derivative method for the estimation of Rosiglitazone maleate in tablet dosage were found to be simple, accurate and reproducible. Beer- Lambert's law was obeyed in the concentration range of 4-40 µg/ml for zero order and 8-40µg/ml for First order derivative method with a regression equation of y=0.04290x+0.005733 and y=0.00423x+0.00293 respectively as given in figure:2, table:1 and figure:4, table:4 with a λmax of 245nm and 218nm.. The accuracy of the method was assessed by recovery studies at three different levels i.e. 50%, 100%, 150%. The values of recovery studies were close to 100% and %RSD value is ≤ 2 represents the accuracy of the method as shown in table:2 and table:5. The lowest concentration of the analyte was detected and the result was found out to be 0.35, 0.40 and the lowest quantity of analyte was detected and the result was found out to be 1.0 for Rosiglitazone in zero order and first order respectively as mentioned in table:1 and table:4 calculated on the basis of signal to noise ratio.% estimated from label claimed of the formulations are from 98% to 100% as given table:2 and table:5.

CONCLUSION

Both these methods i.e. zero order and first order derivative methods were found to be simple, sensitive, precise and reproducible. These methods can be used for routine quality control analysis of Rosiglitazone Maleate in bulk drugs and in pharmaceutical formulations.

REFERENCES

1. Ajjan RA, Grant PJ (2008). "The cardiovascular safety of Rosiglitazone". Expert Opin Drug Saf 7 (4): 367–76.
2. Hannele Yki-Järvinen, New Engl J Med 351:1106-1118 (September 9, 2004)
3. Mohanty P, Aljada A, Ghanim H, Hofmeyer D, Tripathy D, Syed T, Al-Haddad W, Dhindsa S, Dandona P (2004). "Evidence for a potent antiinflammatory effect of rosiglitazone". J Clin Endocrinol Metab 89 (6): 2728–35.
4. Risner ME et al. (2006). "Efficacy of rosiglitazone in a genetically defined population with mild-to-moderate Alzheimer's disease". The Pharmacogenomics Journal 6 (4): 246–254.
5. Risner ME et al. (2006). "Efficacy of rosiglitazone in a genetically defined population with mild-to-moderate Alzheimer's disease". The Pharmacogenomics Journal 6 (4): 246–254.
6. Lewis JD, Lichtenstein GR, Deren JJ, et al. (2008). "Rosiglitazone for Active Ulcerative Colitis: A Randomized Placebo Controlled Trials". Gastroenterology 134 (5): 688–695.
7. Boggild AK, Krudsood S, Patel SN, Serghides L, Tangpukdee N, Katz K, Wilairatana P, Liles WC, Looareesuwan S, Kain KC (2009). "Use of Peroxisome proliferator-activated receptor gamma agonists as adjunctive treatment for Plasmodium falciparum malaria: A randomized, double-blind, placebo-controlled trial.". Clin. Infect. Dis..
8. Firoz Khan, Anil Bhandari, Balram Soni, Sanjay Sharma." Development and validation of lornoxicam by second order derivative spectroscopy";International Journal of Pharmacy and Pharmaceutical Sciences;Vol 3(4), 2011
9. Kiran RP, Vipul PR, Jaiprakash N, Sangshetti and Devanand BS Stability-indicating LC method for analysis of lornoxicam in the dosage form. International Journal of Pharmacy and Pharmaceutical Sciences 2008; 2(4) :20.