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UV and Visible Spectrophotometric Analysis of Pioglitazone Hydrochloride in Bulk and Tablets

R. S. MEHTA*, D. M. PATEL, K. K. BHATT AND M. B. SHANKAR
A. R. College of Pharmacy and G.H. Patel Institute of Pharmacy, Vallabh Vidyanagar–388 120

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Two simple, accurate and economical spectrophotometric methods in ultraviolet and visible region were developed for the determination of pioglitazone hydrochloride in bulk drug and in pharmaceutical formulation. In method A pioglitazone hydrochloride showed λ_{max} at 269 nm in 0.2 N sulphuric acid solution, showing linearity in the concentration range of 10–60 µg/ml whereas in method B pioglitazone hydrochloride was reacted with diazotized sulphanilic acid in an alkaline medium. Yellowish orange coloured chromogen showed λ_{max} at 420 nm, showing linearity in the concentration range of 10–50 µg/ml. The results of analysis have been validated statistically and recovery studies confirmed the accuracy of the proposed method.

Pioglitazone hydrochloride (PGH) is the newest class of oral antidiabetic drug and, chemically, it is [1(A)-5[[4-[2-(5-ethyl-2-pyridinyl) ethoxy] phenyl] methyl]-2,4] thiazolidine dione mono hydrochloride. It is not official in any of the pharmacopoeia. Literature survey revealed very few analytical methods which include HPLC[1,2]. But there is no evidence in literature for estimation of this drug by UV and visible spectrophotometric methods.

Spectral and absorbance measurements were made on a Chemito Spectra Scan 2600 UV/Vis spectrophotometer for estimation in UV and on a Perkin Elmer Lamda 19 UV/Vis/NIR spectrophotometer for estimation in visible range by using 1-cm quartz cells. Gift samples of pioglitazone hydrochloride were obtained from Zydus Cadila Healthcare Ltd., Ahemedabad and Macro Laboratories., Banglore. All the reagents used were of analytical grade. Tablets of two different brands (Pionorm, Macro Labs Ltd. and Piozone, Nicholas Piramal India Ltd.) containing 15 mg of PGH were procured from the local pharmacy.

For the UV Method, standard drug solution of PGH was prepared by dissolving 10 mg drug in 25 ml of 0.2 N sulphuric acid to get a concentration of 400 µg/ml. To construct Beer's

***For correspondence**
E-mail: rsmehta2003@yahoo.com

plot, (0.25-1.5 ml, 400 µg/ml) were taken and diluted with 0.2 N sulphuric acid to 10 ml. The absorbance was measured at 269 nm against a reagent blank for each solution and the calibration curve was plotted.

For analysis of commercial formulations, twenty tablets were weighed. An accurately weighed quantity of powder equivalent to 10 mg PGH was transferred into a 25 ml volumetric flask and dissolved in 0.2 N sulphuric acid by shaking for a few minutes. Then the solution was filtered and further diluted with 0.2 N sulphuric acid. Absorbance value was recorded on a spectrophotometer at 269 nm.

For the colourimetric method, 1.0 ml sulphanilic acid solution (1% w/v) was taken in a series of 10 ml volumetric flasks. To each of these flasks 1.0 ml of sodium nitrite solution (0.5 % w/v) was added and contents were mixed well and allowed to stand for five minutes (solution I). In another set of 10 ml volumetric flasks aliquots of PGH ranging from 0.25-1.25 ml (400 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 final concentration of 10, 20, 30, 40 and 50 µg/ml of PGH. The contents were heated on a boiling water bath for 15 min and cooled to room temperature. The absorbance was measured at 420 nm against a reagent blank for each solution and calibration curve was plotted.

For analysis of commercial formulations, twenty tablets were weighed. An accurately weighed quantity of powder equivalent to 10 mg of PGH was transferred into a 25 ml volumetric flask and dissolved in chloroform:methanol (1:1.5) and further diluted with chloroform:methanol. The resulting solution was then filtered and solvent evaporated. The residue was dissolved in 0.2 N sulphuric acid to give final concentration of 400 µg/ml. Aliquots of this solution were treated similar to standard as given above. Absorption values were recorded on spectrophotometer at 420 nm against a reagent blank.

The optical characteristics such as Beer's law limits, molar absorptivity for each method are given in Table 1. The precision of each method was found by measuring absorbances of six replicates containing known amounts of drug and the results obtained are incorporated in Table 1. Regression analysis using the method of least square was made to evaluate the slope (b), intercept (a), correlation coefficient (r) and relative standard deviation for each method and are presented in Table 2. The accuracy of each method was ascertained by comparing the results by proposed and reference method[2] statistically by the t-and F tests. The comparison shows that there is no significant difference between the results of each proposed method and that of the reference ones. The similarity of the results is obvious evidence that during the application of these methods, the additives and excipients that usually exist in tablets do not interfere in the assay of proposed methods. As an additional check of accuracy of proposed methods, recovery experiments were performed by adding drug to the preanalysed formulations. The percentage recoveries were found to be written in %.

TABLE 1: OPTICAL CHARACTERISTICS, PRECISION AND ACCURACY OF THE PROPOSED METHODS

Parameters	Method A	Method B
Absorption Maxima	269 nm	420 nm
Beer's law limits (µg/ml)	10 to 60	10 to 50
Molar absorptivity (l/mole.cm)	8.2901×10^3	5.9327×10^3
Regression equation Y=(a+bc)		
Slope (b)	0.0211	0.0151
Intercept (a)	-0.0025	0.1279
Correlation coefficient (r)	0.9998	0.9997
% Relative Standard Deviation	0.89	0.94
% Range of Error		
0.05 confidence limits	0.3363	0.2377
0.01 confidence limits	0.5621	0.3970

c is the concentration in µg/ml

TABLE 2: ANALYSIS OF PIOGLITAZONE HYDROCHLORIDE BY PROPOSED METHODS

Tablets	Labelled amount (mg)	Amount Estimated* (mg)		% Recovery		
		Method A	Method B	Reference method	Method A	Method B
1	15	14.87±0.12	14.93±0.12	100.77	99.13	99.53
2	15	14.99±0.13	15.04±0.06		99.93	100.26

*Values are Mean±SEM of three determinations.

The results reveal the suitability of the proposed methods for estimation of pioglitazone.

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Spectrophotometric Determination of Tranexamic acid in Pharmaceutical Dosage Forms

P. MISHRA* AND G. GARG

Department of Pharmaceutical Sciences, Dr. H. S. Gour University, Sagar-470 003

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A simple, rapid, precise, highly specific and economical spectrophotometric method has been developed for the determination of tranexamic acid in its pharmaceutical dosage forms. The method is based on the reaction of the drug with sodium 1,2-napthoquinone-4-sulphonate forming reddish orange coloured chromogen with absorption maximum at 474 nm. The chromogen obeyed linearity in the concentration range of 10-70 μg/ml.

Tranexamic acid is (*trans*-4-aminomethyl cyclohexane carboxylic acid) is used in haemophilic patients to prevent haemorrhage and to reduce the need for replacement of blood factors[1,2]. Its most interesting use has been in the treatment of malignant ovarian tumors, to promote formation of a fibrin capsule to wall off and inhibit growth of the tumor[3]. The drug is official in BP[4]. A few spectrophotometric methods are reported in literature for the estimation of tranexamic acid in formulations[5-8]. In addition, HPLC method is reported for the estimation of tranexamic acid in formulation and in plasma and serum[9]. Other methods of estimation include gas-chromatography[10] and spectrofluorometric[11] determination in pharmaceutical dosage forms. In the present communication we report yet another very simple colorimetric estimation procedure.

A GBC Cintra 10 UV/vis spectrophotometer with 10 mm matched quartz cells was used in the present study. The chemicals used were of analytical grade. Sodium 1,2-napthoquinone-4-sulphonate (Merck, 0.5% w/v in distilled water, NQS) was prepared. The commercially available tablets (TX, Ochoa Labs New Delhi and T Clot, Tidal Labs Mumbai), capsules (Cymin, Wockhardt, Mumbai) and injections (Clip, FDC Ltd, Mumbai) of tranexamic acid were procured from a local pharmacy. Tranexamic acid (analyzed sample) as provided by Aristo Pharma Pvt. Ltd. was used as such without further purification.

A solution of tranexamic acid was prepared by dissolving 10 mg (accurately weighed) of the standard tranexamic acid in 10 ml of distilled water. This stock solution was further diluted to get a working standard solution of 100 μg/ml for colorimetric estimation. Aliquots (1, 2, 3.....7 ml) of working standard solution were transferred into a series of 10 ml volumetric flasks. To that 0.5 ml solution of NQS was added. The volumetric flasks were kept on boiling water bath for 30 min. The volumes were made up after cooling with distilled water. The absorbance of the reddish orange chromogen was measured at 474 nm against reagent blank, and the calibration curve plotted.

Average weight of twenty tablets was determined and

***For correspondence**

E-mail: pmishra51@rediffmail.com