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Research Article

SPECTROPHOTOMETRIC ESTIMATION OF GEMFIBROZIL IN BULK AND PHARMACEUTICAL DOSAGE FORMS

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ABSTRACT
A simple, sensitive and accurate UV spectrophotometric method has been developed for the determination of Gemfibrozil in bulk and pharmaceutical tablet dosage formulation. This method obeys Beer's law in the concentration range of 30-90 µg/ml. with correlation coefficient of 0.9993 and exhibiting maximum absorption at 276 nm with apparent molar absorptivity of 0.1703×10^4 L $mole^{-1}$ cm^{-1}. The method is accurate and precise and is extended to pharmaceutical tablet dosage forms and there was no interference from any common pharmaceutical additives and excipients. The results of analysis were validated statistically and by recovery studies.
KEYWORDS: Gemfibrozil, Linearity, Precision, Recovery studies, Correlation coefficient, UV spectrophotometry.

INTRODUCTION

Absorption spectroscopy is one of the most valuable analytical techniques; its advantages include simplicity, speed, specificity and sensitivity[1]. Gemfibrozil (GEM) is 5-(2, 5-dimethylphenoxy)-2, 2-dimethylpentanoic acid. The drug is used for the treatment of hyperlipidemia. Gemfibrozil is a lipid regulating agent which decreases serum triglycerides and very low density lipoprotein (VLDL) cholesterol, and increases high density lipoprotein (HDL) cholesterol. While modest decreases in total and low density lipoprotein (LDL) cholesterol may be observed with drug therapy, treatment of patients with elevated triglycerides due to Type IV hyperlipoproteinemia often results in a rise in LDL cholesterol. LDL-cholesterol levels in Type II-b patients with elevations of both serum LDL-cholesterol and triglycerides are, in general, minimally affected by drug treatment; however, Gemfibrozil usually raises HDL-cholesterol significantly in this group. Gemfibrozil increases levels of high density lipoprotein (HDL) sub fractions HDL2 and HDL3, as well as apolipoproteins AI and AII. It also increases activity of peroxisome proliferators-activated receptor-alpha (PPAR-α) 'transcription factor ligand', a receptor that is involved in metabolism of carbohydrates and fats, as well as adipose tissue differentiation. This increase in the synthesis of lipoprotein lipase thereby increases the clearance of triglycerides[2,3]. A literature survey regarding quantitative analysis of drug revealed that attempts were made to develop analytical methods for Gemfibrozil and its metabolite in plasma using Gas chromatography[4], RP-HPLC[5], LC-MS[6-7] and also developed method with combination of Gemfibrozil and Rosiglitazone in human plasma using spectroflourimetric[8] and RP-HPLC[9] and also developed method for Gemfibrozil in pharmaceutical dosage form using spectroflourimetric method[10]. The Aim of the work was to develop an accurate, specific and reproducible UV-Spectrophotometric method for the determination of Gemfibrozil in dosage form. The proposed method was optimized and validated in accordance with International Conference on Harmonization (ICH) guidelines.

MATERIAL AND METHODS

Equipment and Reagent

Perkin Elmer, Lambda-19 double beam UV- visible spectrophotometer with a matched pair of 10mm quartz cells are used for experimental purpose. Methanol (Merck-AR grade) is used. The commercially available brand containing Gemfibrozil 600mg have procured from local market.

Preparation of standard stock solution

Accurately weighed 100 mg of Gemfibrozil pure drug taken in separate 100 ml. volumetric flask and dissolved in 70 ml of Methanol and shaken for 30 min and then diluted with methanol up to 100 ml to get 1 mg/ml. standard stock solution.

Construction of calibration curve

Aliquots of standard stock solution were pipetted out and suitably diluted with methanol to get the final concentration of 30-90 µg/ml. The solution was scanned in the spectrum mode from 400 nm - 200 nm wavelength range and a sharp peak was obtained at 276 nm (Fig 2).

Calibration curve (Fig 3) was constructed by plotting the absorbance against the concentration and regression equation was computed. The results for linearity study were tabulated (Table 1).

Analysis of formulation

For the estimation of Gemfibrozil from tablets, 20 tablets were weighed separately and their average weight was calculated. Tablets were crushed separately in mortar and pastle and passed through fine sieve separately. A portion of the powder equivalent to 100 mg of drug was accurately weighed and transferred to separate 100 ml volumetric flasks. The drug was dissolved by adding 70 ml of methanol to the volumetric flask with constant stirring for 15-20 min in sonicator. Volumes were made up to mark with methanol. Sample solution of 10 ml transferred to 100 ml volumetric flask and diluted up to the mark with methanol and diluted the supernatant sample solution to get the concentration of 30-90 µg/ml of Gemfibrozil. Evaluation was performed with double beam spectrophotometer for Gemfibrozil at 276 nm (Table 2).

Validation of proposed method

Accuracy of the method was determined by the recovery studies in the tablets formulations of the Gemfibrozil. Recovery studies were carried out by addition of known quantities of standard drug to pre-analyzed sample at three different concentrations. Also the experiment was repeated three times in a day to determine intra-day precision and on three different days to determine inter-day precision. The percentage relative standard deviation was calculated at each concentration level. The values of method validation as shown in Table 3.

RESULTS AND DISCUSSION

Beer's law is obeyed over the concentration range of 30-90 µg/ml, using regression analysis the linear equation Y = 0.0067x - 0.0045 with correlation coefficient of R^2 = 0.9993. The sandell's sensitivity and molar absorptivity were found to be 0.1472 and 0.1703×10^4. The detection limit or LOD is the lowest amount of an analyte in a sample that can be detected, but not necessarily quantified, under the stated experimental conditions. Based on the standard deviation of the response of Y-intercept and slope, the detection limit may be expressed as DL = 3.3 σ/s. The limit of detection for Gemfibrozil was found to be 2.5193µg/ml. Quantitation limit or LOQ is the lowest amount of analyte in sample that can be determined with acceptable precision and accuracy under the stated experimental conditions. Based on the standard deviation of the response of Y-intercept and slope, the quantitation limit may be expressed as QL = 10 σ/S. The limit of quantitation for Gemfibrozil was found to be 7.6345µg/ml.

Method was validated in terms of accuracy and precision. The accuracy of the method was proved by performing recovery studies in the commercially available formulations. Values greater than 99% indicate that proposed method is accurate for the analysis of drug and there is no interference from the excipients present in the formulations. The precision of the method was checked in terms of Inter-day and Intra-day, where method were repeated on three different day and also repeated on three different time periods in same day. The results were given in Table 3 and shows % RSD of less than 1% at each level clearly indicate that the method is precise enough for the analysis of the drug.

CONCLUSION

In the above developed method, there was no additional extraction or separation procedure to extract the active ingredient from the formulation. The errors in quantification can be decreased by the elimination of this procedure. Hence, the developed method is, simple, accurate, sensitive and economical for the routine estimation of Gemfibrozil in bulk drug and its pharmaceutical formulations.

REFERENCES

1. Connors KA. A textbook of pharmaceutical analysis. 3rd ed. New Delhi: John Wiley and Sons Inc.; 2007.
2. MedicineNet.com [homepage on the internet], [May 24, 2011], Available from: http://www.medicinenet.com/gemfibrozil-oral/article.htm.
3. LOPID (Gemfibrozil Tablets, USP), Parke-Davis Division of Pfizer Inc. Newyork, [Revised September 2010], Available from: http://www.pfizer.com/files/products/uspi_lopid.pdf
4. Randinitis EJ, Kinkel AW, Nelson C, Parker TD. Gas chromatographic determination of Gemfibrozil and its metabolites in plasma and urine. Journal of Chromatography 1984; 307: 210-215.
5. Randinitis EJ, Parker TD, Kinkel AW. Liquid chromatographic determination of Gemfibrozil and its metabolite in plasma. Journal of Chromatography 1986; 383: 444-448.
6. Gonzalez-Penas E, Agarraberes S, Lopez-Ocariz A, Garcia-Quetglas E, Campanero MA, Carballal JJ, Honorato J. A sensitive method for the determination of Gemfibrozil in human plasma samples by RP-LC. Journal of Pharmaceutical and Biomedical Analysis 2001; 26: 7–14.
7. Roadcap BA, Musson DG, Rogers JD, Zhao JJ. Sensitive method for the quantitative determination of Gemfibrozil in dog plasma by liquid–liquid cartridge extraction and liquid chromatography–tandem mass spectrometry. Journal of Chromatography B 2003; 791: 161–170.
8. Mohie MK, Sharaf El-Din, Khalid AM, Mohamed WI, Mohamed MY. Two different Spectrofluorimetric methods for simultaneous determination of Gemfibrozil and Rosiglitazone in human plasma. Talanta 2010; 82: 1708–1716.
9. Xin K, Feng W, Zhihong X, Huande L. A high performance liquid chromatography method for simultaneous determination

of Rosiglitazone and Gemfibrozil in human plasma. Journal of Chromatography B 2009; 877: 645–648.
10. Manzoori JL, Mohammad A. Spectrofluorimetric and micelle-enhanced Spectrofluorimetric methods for the determination of Gemfibrozil in pharmaceutical preparations. Journal of Pharmaceutical and Biomedical Analysis 2003; 31: 507-513.
11. Validation of Analytical Procedures: Methodology, ICH Harmonised Tripartite Guidelines 1996: 1-8.

Table 1: OPTICAL PARAMETER FOR GEMFIBROZIL

SR.NO	Parameters	Data
1	λ Max	276 nm
2	Linearity	30-90 µg/ml
3	Regression equation	Y = 0.0067x - 0.0045
4	Correlation coefficient	R^2 = 0.9993
5	Slope	0.0067
6	Intercept	0.0045
7	LOD	2.593 µg/ml
8	LOQ	7.6345µg/ml
9	Sandell's sensitivity	0.1472
10	Molar absorptivity	0.1703 × 10^4L/mole cm

Table 2: RESULT OF ANALYSIS OF GEMFIBROZIL IN PHARMACEUTICAL FORMULATION

Sr.no.	Drug	Amount found (mg/tab)	% Label claim (%)	S.D*	%RSD	S.E*	95% CI	
							Lower	Upper
1	Gemfibrozil Tablets 600mg	598.52	99.75333	0.2122	0.2123	0.0867	99.77	100.11
2		599.2	99.86667					
3		599.34	99.89					
4		598.92	99.82					
5		600.15	100.025					
6		602.05	100.3417					

*(n=6), S.D = standard Deviation, % RSD = Percentage relative Standard Deviation, S.E = Standard Error, C.I = Confidence Interval.

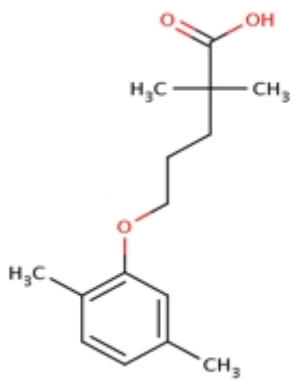
Table 3: VALIDATION DATA FOR PROPOSED METHOD: FOR ACCURACY

Amt. of sample	Amt. of drug added	Amt. of drug recovered	% Recovery
Gemfibrozil mg	Gemfibrozil mg	Gemfibrozil mg	Gemfibrozil %
30	0	-	-
30	15	44.8	99.56
30	30	59.1	98.50
30	45	75.3	100.40

Table 4: VALIDATION DATA FOR PROPOSED METHOD: FOR PRECISION

Conc. µg/ml	Intra-day (n=3) Mean ± S.D.	CV	Inter-day (n=3) Mean ± S.D.	CV
45	0.298043 ± 0.000974	0.33	0.29767 ± 0.000429	0.14
60	0.396736 ± 0.0009166	0.23	0.396213 ± 0.000524	0.13
75	0.497307 ± 0.001846	0.37	0.4968 ± 0.001538	0.31

*(n=3)



5-(2, 5-dimethylphenoxy)-2, 2-dimethylpentanoic acid

Fig 1: chemical structure of Gemfibrozil

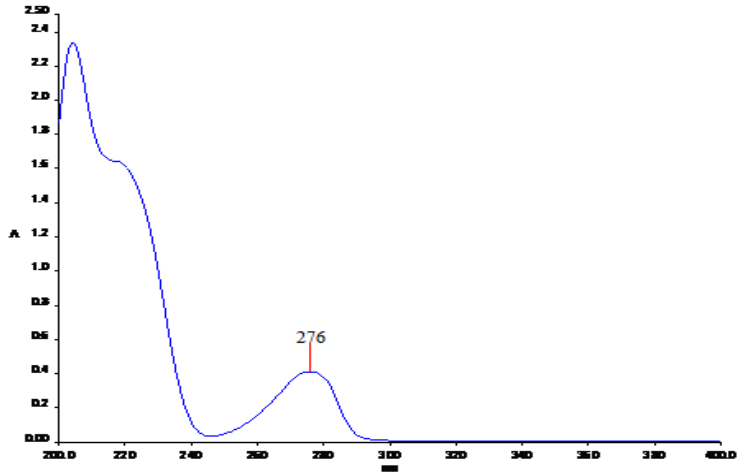


Fig 2: λ-max graph for Gemfibrozil pure drug.

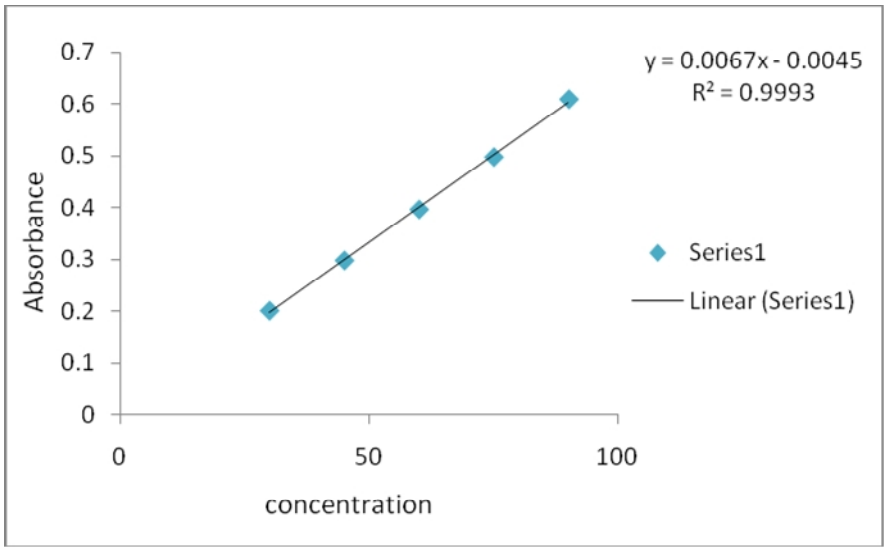


Fig 3: Calibration curve for Gemfibrozil.

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