Research Article CODEN: IJPRNK ISSN: 2277-8713
Prem Kumar Bichala, IJPRBS, 2014; Volume 3(1): 450-458 IJPRBS

INTERNATIONAL JOURNAL OF
PHARMACEUTICAL RESEARCH AND BIO-SCIENCE

NEW METHOD DEVELOPMENT AND VALIDATION OF NEW RP-HPLC METHOD FOR THE ESTIMATION OF VILDAGLIPTIN IN BULK AND TABLET DOSAGE FORM

PREM KUMAR BICHALA[1], DR.A. LASHMANA RAO[2]

1. Assistant professor, chaitanya college of pharmacy, deveragattu, markapur, A.P- 523316
2. Principal, V.V institute of pharmaceutical sciences, gudallavallaru, A.P-521356.

Accepted Date: 22/02/2014; Published Date: 27/02/2014

Abstract: A simple, rapid, precise and cost effective method has been developed and validated for determination of Vildagliptin in pharmaceutical tablet dosage form. The chromatographic separation was carried out with . A shimpack VP-ODS, Shimadzu C18, 150 x 4.6 mm, 5µ, analytical column and mobile phase containing 0.01M phosphate buffer (pH 5.3) and acetonitrile at the ratio (30:70% v/v). pH of the buffer solution was adjusted with orthophosphoric acid. The instrumental settings include flow rate 1 ml/min, column temperature at 30°C and detector wavelength of 210nm using a photodiode array detector. Theoretical plate for Vildagliptin was 2998 and tailing factor was 1.86.

Keywords: Vildagliptin, RP-HPLC, validation, tablet dosage form.

Corresponding Author: Mr. PREM KUMAR BICHALA

Access Online On:

www.ijprbs.com

How to Cite This Article:

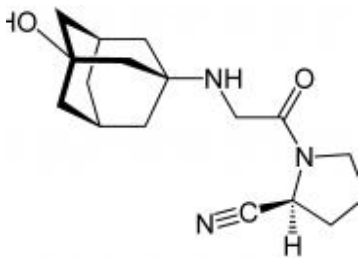
Prem Kumar Bichala, IJPRBS, 2014; Volume 3(1): 450-458

PAPER-QR CODE

INTRODUCTION

Vildagliptin is an oral anti-hyperglycemic agent (antidiabetic drug). Chemically it is (S)-1 [N-(3-hydroxy-1-adamantyl) glycyl] pyrrolidine-2-carbonitrile, is a potent dipeptidyl peptidase IV (dip-IV) inhibitor. DPP-IV inhibitors represent a new class of oral antihyperglycemic agents to treat patients with type 2 diabetes. DPP IV inhibitors improve fasting and postprandial glycemic control without hypoglycemia or weight gain. Vildagliptin inhibits the inactivation of GLP-1 and GIP by DPP IV, allowing GLP-1 and GIP to potentiate the secretion of insulin in the beta cells and suppress glucagon release by the alpha cells of the islets of Langerhans in the pancreas. [1-5]

Figure 1 structure of Vildagliptin



Literature survey reveals HPLC methods have been reported for the estimation of Vildagliptin into tablet formulation. [5-9] The objective of the present work was to develop simple, rapid, accurate, specific and economic RPHPLC method for the estimation of Vildagliptin in bulk and tablet. The method was further validated as per ICH guidelines for the parameters like precision, accuracy, sensitivity, and linearity. [13] The results of analysis were validated statistically and by recovery studies. [2] These methods of estimation of Vildagliptin were found to be simple, precise, accurate and economic.

MATERIALS AND METHODS

Chemicals and reagents

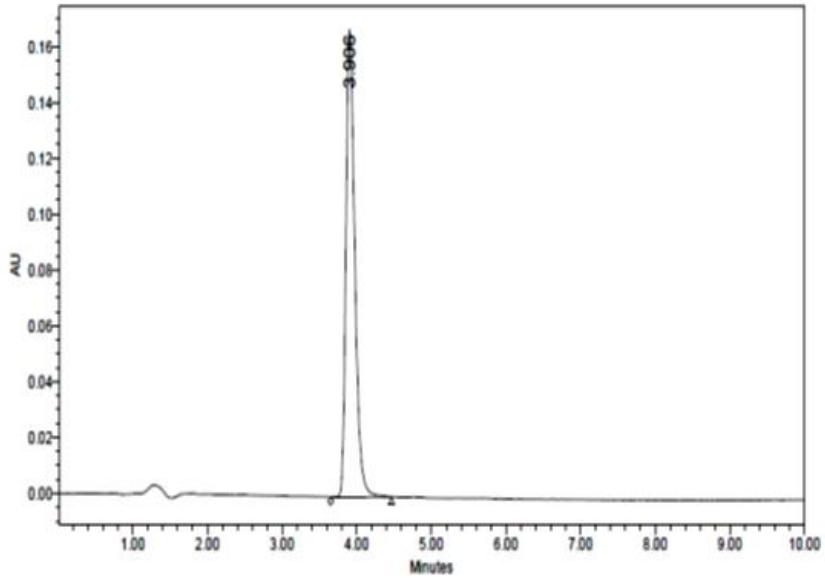
Working standard of Vildagliptin with a potency of 99.78% was collected from Beijing Huikang Boyuan Chemical Tech. Co. Ltd. China. Market sample of Vildagliptin (Galvus) containing 50 mg Vildagliptin were collected from Novartis Eurofarm limited company. HPLC grade Acetonitrile was purchased from Merck, Darmstadt, Germany, Potassium dihydrogen phosphate from Scharlab, Spain and Orthophosphoric acid were purchased from Merck, Darmstadt, Germany. HPLC grade water was obtained through Millipore water purification system (Model- Arium 611DI, Sartorious).

HPLC instrumentation and chromatographic condition

High performance liquid chromatographic system consisted of a Shimadzu LC-20 AT, prominence, equipped with an auto sampler (SIL-20AC HT, Shimadzu, Japan) and PDA detector (SPD- M20A, Japan) was used for the analysis. The data was recorded using LC-solution software. A shimpack VP-ODS, Shimadzu (150mm x 4.6mm, 5µm) column was used for the analysis. A powersonic 505 ultrasonic bath (Hwashin technology, Seoul, Korea) was used for degassing of the mobile phase. In addition a pH meter (Mettler Toledo, Switzerland) and an electronic balance (Model- CP224S, Sartorious, Germany) were used in the present work.

The separation was carried out using a mobile phase consisting of 0.01M phosphate buffer and acetonitrile with pH 5.3, (adjusted with orthophosphoric acid) in the ratio of 30:70% v/v. The mobile phase was filtered, sonicated and degassed before use. The column was maintained at a temperature of 30ºC with column oven (CTO-20AC) and the flow rate was 1 ml/min. Analysis was performed with injection volume of 10µl using PDA detection at 210 nm.The run time was set for 10 minutes. The typical retention time of Vildagliptin peak is about 3.8 min which is shown in figure 2.

Figure 2 **Chromatogram of Vildagliptin in standard solution**



	RT	Area	% Area	USP Plate Count	USP Tailing
1	3.906	1385634	100.00	5378	1.35

Preparation of stock and standard solutions with calibration curve:

Standard stock solution of vildagliptin was prepared by dissolving 50 mg of the drug in 10ml of Acetonitrile HPLC grade. Aliquots of working standard solution (0.5 – 1.5ml) were taken and diluted with mobile phase to obtain series of solution in the concentration range of 250 - 750 µg/ml. All the solutions were injected and the chromatograms were recorded at 210 nm and calibration curve was plotted using peak area Vs concentration graph shown in the figure 3. The values of slope and correlation coefficient were found to be 3587 and 0.999 respectively.

Assay of tablet formulation

Ten tablets of vildagliptin Galvus (50 mg), Novartis, India Ltd. were accurately weighed and average weight of tablet formulation was determined. The tablets were crushed, the tablet powder equivalent to 50 mg of vildagliptin was transferred to a 50ml volumetric flask. Dissolve the active ingredients and volume was made up to 50ml with Acetonitrile, the contents were sonicated for 15 minutes, centrifuged at 2000 rpm for 15 minutes and filtered through a 0.2µ membrane filter. From the clear solution, This solution was used for further analysis. 1 ml of test solution was transferred into six 10 ml volumetric flasks and made up to the mark with mobile phase. A 20µl volume of each sample solution was injected into the sample injector of HPLC six times under the chromatographic conditions as described. The peak area was measured at 210nm. The amount of drug present in the sample solutions were determined using calibration curve of standard Nevirapine. The results are shown in table 4.

METHOD VALIDATION

Linearity

The plot of absorbance against concentration is shown in fig 3. It can be seen that plot is linear over the concentration range of 250 to 750µg/ml for HPLC. vildagliption with a correlation coefficient (r^2) 0.999.

Precision

Intra day and inter day precision was determined by repeating assay three times on the same day for intra day and on different days for inter day precision. The relative standard deviation for six replicates of sample solution was less than 2.0%, which met the acceptance criteria established for spectroscopic method. The obtained results were presented in table 3.

Accuracy

To check the accuracy of the proposed method, recovery studies were carried out at 80,100,120% of the test concentration as per ICH guidelines and low relative standard deviation

value show the accuracy of the Spectroscopy and HPLC methods. The data were presented in table 4.

LOD and LOQ (sensitivity)

The LOD and LOQ were separately determined based on the standard deviation of response of the calibration curve. The relative standard deviation of the regression lines and slope of the calibration curve were used to calculate LOD and LOQ.

Standard and sample solution stability

Standard and sample solution stability was evaluated at room temperature for 48 hours. The relative standard deviation was found below 2.0%. It shows that standard and sample solution were stable up to 48 hours at room temperature.

RESULTS AND DISCUSSION

In this study a simple, fast and reliable HPLC methods were developed and validated for the determination of vildagliption in bulk and pharmaceutical formulation. As these proposed method have the lowest LOD values and wider linearity range is more sensitive method. From the results obtained, we conclude that the suggested methods showed high sensitivity, accuracy, reproducibility and specificity. Moreover, these method was simple and in expensive and this can be employed for the routine quality control of Nevirapine in bulk and pharmaceutical formulation.

CONCLUSION

Proposed study describe a new RP-HPLC method for the estimation of vildagliptin using simple mobile phase with low buffer concentration compared to the proposed methods. The method gives the short analysis time (< 5 min). The method was validated and found to be simple, sensitive, accurate and precise. The percentage of recovery shows that the method is free from interference of the excipients used in the formulation. Therefore, the proposed method can be used for the routine analysis of vildagliptin in dosage form.

ACKNOWLEDGEMENTS

The authors thank full to the CIPLA Ltd. Mumbai. India for providing gift sample.

FIGURES AND TABLES

Fig 2: Calibration curve of vildagliptin by RP – HPLC method

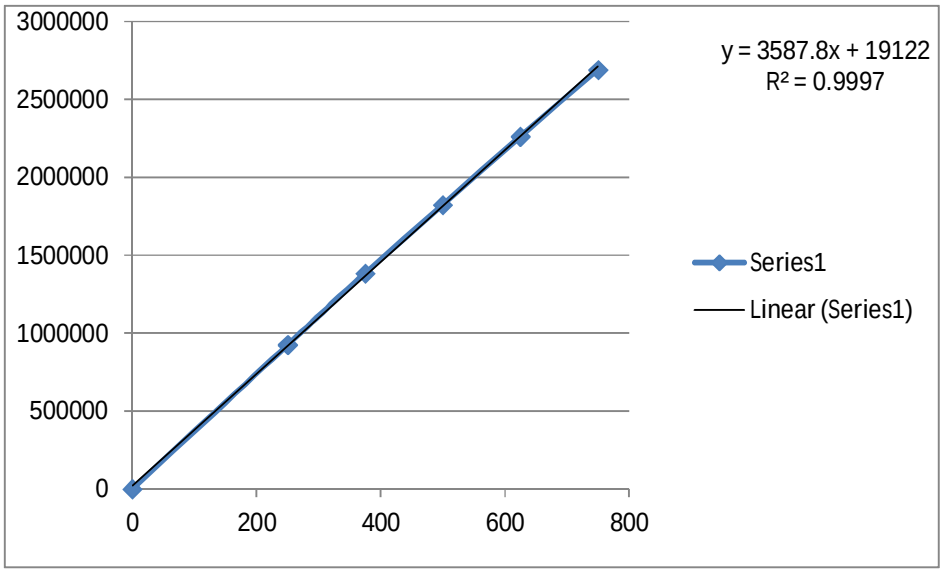


Table 1: Optical characteristics of Vildagliption by RP-HPLC method

S.NO	PARAMETERS	OBSERVED VALVES*
1	λmax (nm)	210
2	Beer's law limit (µg/ ml)	250 - 750
3	Correlation coefficient (r)	0.9997
4	Regression equation (y = mx + c)	Y = 3587x + 19122
5	Slope (m)	3587
6	Intercept (c)	19122
7	Theoretical plate	2998
8	Tailing factor	1.86
9	LOD (µg/ ml)	0.386426
10	LOQ (µg/ ml)	1.17099
11	Standard error	19139.49

***Mean of three observation**

TABLE – 2 QUANTIFICATION OF FORMULATION (GALVUS) – RP - HPLC

Drug	Sample No.	Labeled amount (mg/tab)	Amount found (mg)	Percentage obtained	Average (%)± S.D	% R.S.D.	S.E.
	1	50	49.58	99.16			
	2	50	50.23	100.1			
VDG	3	50	49.20	98.4	99.95	1.0235	0.4176
	4	50	5.00	100.00	±1.023		
	5	50	50.64	101.28			
	6	50	50.22	100.44			

Table 3: Inter day and Intra day analysis of formulation – GALVUS by RP – HPLC method

Drug	Sample No.	Labeled amount (mg/tab)	Percentage obtained*		± S.D		% R.S.D.	
			Intra day	Inter day	Intra day	Inter day	Intra day	Inter day
	1	50	100.05	99.63				
	2	50	100.22	99.80				
VDG	3	50	99.87	99.64	±0.1823	±0.1397	0.18208	**0.14014**
	4	50	100.05	99.8				
	5	50	100.39	99.46				
	6	50	100.23	99.81				
Mean			**100.14**	**99.69**				

TABLE – 4 RECOVERY ANALYSIS OF FORMULATION (GALVUS) BY

RP - HPLC

Drug	Sample No.	Amount present (µg/ml)	Amount added (µg/ml)	Amount estimated* (µg/ml)	Amount recovered (µg/ml)	% Recovery	± S.D	% R.S.D	S.E.
	1	2.05	2	4.078	2.028	101.4			
VDG	2	2.05	4	6.136	4.086	102.15	±1.0050	0.9927	0.5802
	3	2.05	6	8.06	6.01	100.16			

REFERENCES

1. *Aparajita Malakar** et al, development and validation of rp-hplc method for estimation of vildagliptin from tablet dosage form, International Journal of Pharmaceutical and Life 1, Issue 1, Serial 2: August 2012.

2. *B. pharne2 et al,* bioanalytical method development and validation of vildagliptin a novel dipeptidyl peptidase iv inhibitor by rp-hplc method, International Journal of Pharmacy and Pharmaceutical Sciences ,ISSN- 0975-1491 Vol 4, Issue 3, 2012

3. *B.Santhosha et al*, Validated method for the simultaneous estimation of Metformin Hydrochloride and Vildagliptin by RP-HPLC in bulk and the pharmaceutical dosage form, Int. Res J Pharm. App Sci. Vol-II, Issue-III, May-Jun, 2012.

4. H Beckett, J.B Stenlake (2002) Practical Pharmaceutical Chemistry. Fourth edition, Part 2, CBS Publishers and Distributors, New Delhi, 275-278.

5. ICH, Q2 (R1), Harmonized tripartite guideline, Validation of analytical procedures: text and Methodology International Conference on Harmonization.

6. Rao B.M., Ravi R., Shyamsundar reddy B., Sivakumar S., Gopichand, Praveen kumar, K., Acharyulu, P.V., Reddy, G.Om., aand Srinivasu, M.K., J pharm Biomed Anal, 2004, Aug 18,745(2), 325.

7. Subhakar Nandipati, V. Krishna Reddy, T. Ravindranadh Reddy. Development and Validation of RP-HPLC method for Simultaneous Determination of Vildagliptin and Metformin in Bulk and

Formulation Dosage. International Research Journal of Pharmaceutical and Applied Sciences. Int. Res J Pharm. App Sci., 2012; 2(3):44-50.

8. *Thangabalan Boovizhikannan* et al, RP-HPLC determination of vildagliptin in pure and in tablet formulation, International Journal of Biomedical Science 7(3), 201-208, Sep 15, 2011.