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Visible spectrophotometric methods for determination of Sitagliptine in tablets

CH. HARI PRASAD*, P. CHANDY SUSHMA, G. DEVALA RAO and G. SUDHAKARA SAI BABU

K.V. S. R. Siddhartha College of Pharmaceutical Sciences, Vijayawada - 520 010 (India).

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ABSTRACT

Two simple and sensitive visible spectrophotometric methods have been developed for the estimation of Sitagliptine in pure and pharmaceutical dosage forms. These methods are based on the nucleophillic substitution reaction between NQS and Sitagliptine resulting in the formation of colored chromogen (λ_{max} 450 nm) and the reaction between Picric acid (PA) and Sitagliptine resulting in the formation of molecular salt (λ_{max} 420 nm). The absorbance is measured against the corresponding reagent blanks. These methods have been statistically evaluated and found to be precise and accurate.

Key words: Spectrophotometry, sitagliptine.

INTRODUCTION

Sitagliptine which is chemically 7-[(3*R*)-3-amino-1-oxo-4-(2,4,5-trifluorophenyl)butyl]-5,6,7,8-tetrahydro-3-(trifluoromethyl)-1,2,4-triazolo[4,3-α]pyrazine phosphate (1:1) monohydrate. Sitagliptin is a DPP-4 inhibitor, which is believed to exert its actions in patients with type 2 diabetes by slowing the inactivation of incretin hormones. Incretin hormones, including glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP), are released by the intestine throughout the day, and levels are increased in response to a meal. These hormones are rapidly inactivated by the enzyme, DPP-4. A number of methods such as HPLC was reported for the estimation of Sitagliptine, in its pure form and pharmaceutical formulations. Literature survey reveals that Visible Spectrophotometric methods have not been reported for its quantitative determination its pure form and pharmaceutical formulations. In the present investigation, The simple and sensitive visible spectrophotometric methods have been developed for the determination of Sitagliptine. The developed method involve the formation of colored chromogen(yellow) with NQS and Picric acid(PA). These colored chromogen showed absorption maximum at 450 nm and 420 nm respectively. Beers law is obeyed in the concentration range of 25-150 µg/ml and 5- 25 µg/ml . The results of analysis for the these methods have been validated statistically and by recovery studies.

EXPERIMENTAL

Preparation of Reagents

1. NQS reagent preparation: 0.6g of NQS in 100ml distilled water.
2. Saturated Sodium sulphate solution: Dissolve excess amount of Sodium sulphate in 100ml of distilled water.
3. NaOH (0.01M) solution: 0.04g of NaOH in 100 ml distilled water.
4. Standard drug solution(NQS): Accurately weighed 100mg of Sitagliptine in 100ml distilled water.
5. Picric acid reagent preparation: 0.4g of Picric acid in 100ml distilled water.
6. Standard drug solution(PA): Accurately weighed 100mg of Sitagliptine in 100ml chloroform.

Assay Procedures

Method A (NQS)

Aliquots of working standard solution of Sitagliptine ranging from 0.25-1.5ml were transferred in to a series of 10ml volumetric flasks. To these 1ml of NaOH and 1ml of NQS solutions were added and heated for 45 min. Cooled in ice and transferred to a series of separating funnels containing saturated Sodium sulphate solution (approx 10ml). Shaken for 2minutes. Finally add 10ml of chloroform to each separating funnel. The contents were shaken for 2 minutes and collect the chloroform layer. The absorbance of the yellow colored chromogen was measured at 540 nm against reagent blank and the amount of Sitgliptine present in the sample was computed from its calibration curve.

Method B (PA)

Aliquots of working standard solution of Sitagliptine ranging from 0.25-1.25ml were transferred in to a series of 10ml volumetric flasks. To these 1ml of Picric acid solution was added and finally volume was made up to 10ml with chloroform.

RESULTS AND DISCUSSION

The optical characteristics such as Beer's law limits, Sandell's sensitivity, molar extinction coefficient, percentage relative standard deviation, percentage range of error (0.05-0.01) were calculated for the method and results are summarized in table 1. The values obtained for the determination of Sitagliptine in pharmaceutical

Table 1: Optical characteristics, precision and accuracy of the proposed method

Parameters	Method A	Method B
λ_{max} (nm)	450	420
Beer's law limit (µg/ml)	25-150	5-25
Sandell's sensitivity (µg/cm^2/0.001 abs. unit)	0.191	0.025
Molar absorptivity(litre.mole^{-1}.cm^{-1})	0.27×10^4	1.40×10^4
Regression equation(Y*)		
Slope(b)	0.3018	0.2346
Intercept(a)	0.1034	0.0873
Correlation Coefficient(r)	0.9992	0.9987
%Relative standard deviation	0.72	0.48
% Range of error		
0.05 Significance level	0.602	0.401
0.01 Significance level	0.885	0.593

Y* = a + bx, where Y is absorbance and x is concentration of Sitagliptine in µg/ml.

Table 2: Estimation of Sitagliptine in pharmaceutical formulations

Formulations (tablets)	Labelled Amount	Amount found* by proposed method		% recovery** by proposed method	
	(mg)	Method A	Method B	Method A	Method B
Tablets 1	100	98	99.2	98.3	99.13
Tablets 2	100	99.2	98.6	99.62	99.23
Tablets 3	100	96.4	97.7	98.26	98.8

*Average of determinations

**Recovery of amount added to the pharmaceutical formulation

(Average of three determinations).

formulation (tablets) by the proposed method is presented in table 2. Studies reveal that the common excipients and other additives usually present in the tablets did not interfere in the proposed methods

CONCLUSION

The proposed methods are applicable for the assay of drug Sitagliptine and have an advantage of wider range under Beer's law limits. The proposed methods are simple, selective and reproducible and can be used in routine determination of Sitagliptine in pure form and formulation with reasonable precision and accuracy.

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