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Simultaneous Estimation of Sitagliptin and Simvastatin by UV-Spectrscopy

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ABSTRACT

This present work is concerned with the application of simple, accurate, precise and highly selective u.v method for simultaneous estimation of Sitagliptin and Simvastatin in Bulk drugs. The developed method was validated for linearity, accuracy, precision, limit of detection, limit of quantification, parameters and found to be in good accordance with the prescribed values. Thus the proposed method can be successfully applied for simultaneous determination of Sitagliptin and Simvastatin in routine bulk drug analysis.

Keywords: *Sitagliptin and Simvastatin, U.V, Validation, Bulk drugs.*

INTRODUCTION

Sitagliptin is anti-diabetic drug.It is mainly used in treatment of diabetics. Chemically it is 7-[(3R)-3-amino-1-oxo-4-(2,4,5-trifluorophenyl)butyl]-5,6,7,8-tetrahydro-3-trifluoromethyl)-1,2,4-triazolo[4,3-a]pyrazine phosphate monohydrate (**Fig. 1**). It is a white to off white crystalline powder which is odourless and freely soluble in water. Numerous authors have reported CTZ detection methods in biological fluids and pharmaceutical formulations [2-6].

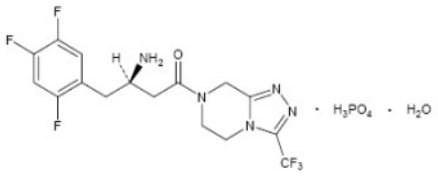

Fig. 1: Structure of Sitagliptin

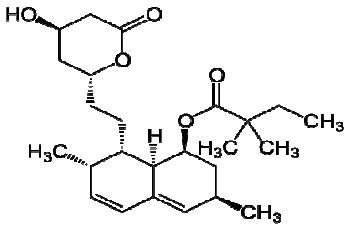

Fig 2: Structure of Simvastitin

Simvastatin is anticholesteremic agent used in treatment diabetis caused due to high cholesterol. Chemically it is**:** (1S,3R,7S,8S,8aR)-8-{2-[(2R,4R)-4-hydroxy-6-oxooxan-2-yl]ethyl}-3,7-dimethyl-1,2,3,7,8,8a-hexahydronaphthalen-1-yl2,2-dimethylbu - tanoate. (**Fig. 2**) It is white, non-hygroscopic, crystalline powder Soluble in Dichloromethane and insoluble in water. The aim of this work is to develop accurate, specific, cost effective, repeatable and validated u.v method for the simultaneous estimation of Sitagliptin and Simvastatin in the bulk drug samples [35, 36, 39].

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EXPERIMENTAL WORK

Buffer and Methanol were mixed in the ratio 25:75 A quantity of powder equivalent to 50mg of Sitagliptin (20mg of Simvastatin) was weighed and transferred into a 50ml volumetric flask and was dissolved in the diluent. The volume was made up to the mark with the same and the resulting solution was labeled as sample stock solution (contains 1mg of Sitagliptin and 0.4mg of Simvastatin per ml).dilution of the sample stock solution and wavelength 200-400nm is taken. Result shown in **Fig-3**.

Validation Parameters:

Accuracy:

Preparation of Standard and Test Solutions:

Mixed standard solutions containing 150µg/ml, 400µg/ml and 650µg/ml of Sitagliptin (60µg/ml, 160µg/ml and 260µg/ml of Simvastatin respectively) were prepared in triplicate, from the mixed standard stock solution by appropriate dilutions. A test solution containing 100µg/ml of Sitagliptin (40µg/ml of Simvastatin) was prepared by appropriate dilution of the sample stock solution.

Procedure of Spiking:

Spiking at 50% level was accomplished in triplicate, by adding 2.5ml of sample stock solution to 3.75ml of mixed standard stock solution (containing 1mg/ml of Sitagliptin and 0.4mg/ml of Simvastatin) in a test tube. The contents of test tube were then cautiously filtered through whatmann filter paper. In order to collect the remnants of the solution, the test tube and filter paper were washed with small quantities of diluent, and the washings were added to the filtrate through the same filter paper. Then the volume of filtrate was made up to 25ml with the diluent and the resultant solution was filtered through 0.45µ membrane filter.

In the similar manner, spiking at 100% and 150% levels was carried out by adding 2.5ml of sample stock solution separately to 10ml and 16.25ml of mixed standard stock solution respectively.

Precision:

Procedure:

The standard solution was prepared as per the proposed assay method in six determinations and was analysed by U.V.

Linearity:

Procedure:

Standards equivalent to 50%, 75%, 100%, 125% & 150% of the stated amount of standard were weighed individually and

the solutions were prepared according to the assay method. A graph of weight taken (%) versus chromatographic area was plotted. The regression line obtained was linear. From the data obtained, co-relation coefficient, slope and y-intercept were calculated. Ideally co-relation coefficient should be not less than 0.999.

Limit of Detection and Limit of Quantification:

The limit of detection and limit of quantification of the present method were established based on the standard deviation of the response and slope. The slopes were calculated from the respective calibration.

RESULT AND DISCUSSION

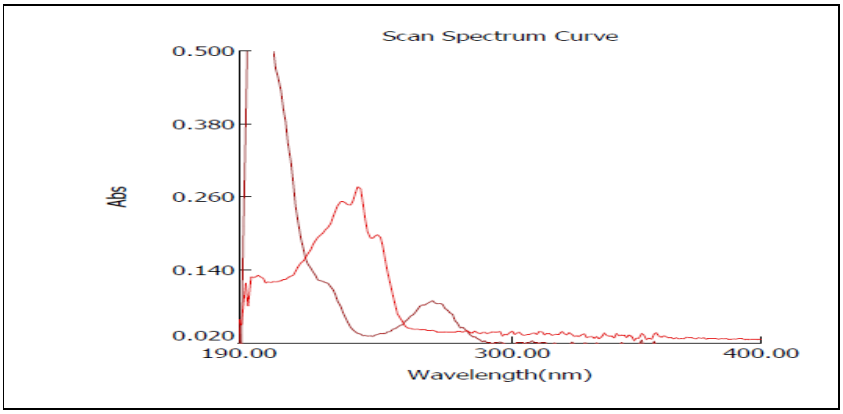

Fig. 3: Simultaneous estimation Spectrum of Sitagliptin and Simvastatin

Accuracy:

Table No. 1: Summary of results of Accuracy parameter for sitagliptin and simvastatin

		% Recovery sitagliptin	% RSD sitagliptin	% Recovery simvastatin	% RSD simvastatin
Accuracy	**80**	98.82	0.405	98.84	0.276
	100	99.53	0.351	98.78	0.296
	120	100.19	0.099	100.18	0.134

Denotes average of three estimations

Precision:

Table No. 2: Summary of results of Precision parameter for sitagliptin and Simvastatin

Precision	Sitagliptin	Simvastatin
Inter-day (%RSD)	0.42	0.31
Intra-day (%RSD)	0.80	0.86

Denotes average of six estimations

Linearity:

Table No. 3: Summary of results of Linearity parameter for Sitagliptin and Simvastatin

Sitagliptin Conc. (ppm)	Avg. Abs	Simvastatin Conc. (ppm)	Avg. Abs
0.5	0.026	**0.5**	0.023
0.7	0.038	**0.7**	0.039
1.0	0.145	**1.0**	0.139
1.2	0.161	**1.2**	0.194

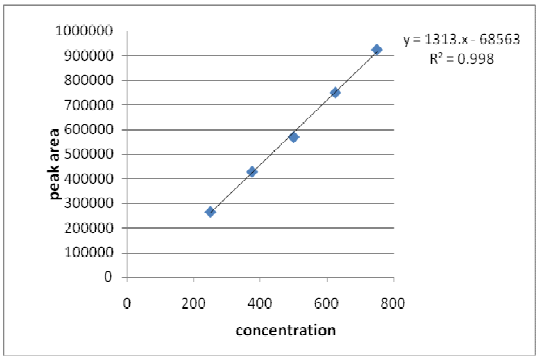

Fig. 4: Graphical Representation of Linearity range of Sitagliptin

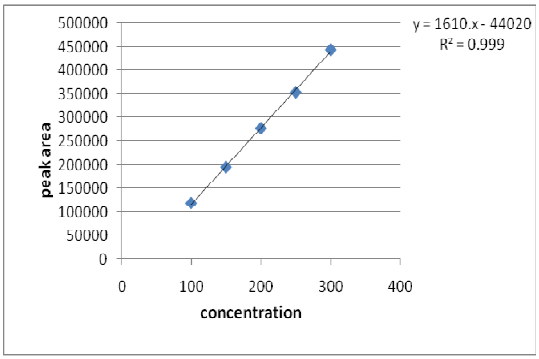

Fig. 5: Graphical Representation of Linearity range of Simvastatin

***Limit of Detection and Limit of Quantification*:**

Table No. 4: Summary of results of LOD and LOQ parameter for Sitagliptin and Simvastin

	Sitagliptin	Simvastatin
LOD [a] ± SD	0.964	3.6
LOQ [a] ± SD	3.63	2.9
Regression coefficient (r^2)	0.998	0.999

CONCLUSION

The developed UV method was developed and validated for the simultaneous determination of Sitagliptin and Simvastatin in bulk drugs. The validation data indicate good precision, accuracy and reliability of the method, the developed method offers several advantages in terms of simplicity in mobile phase, easy sample preparation steps and comparative short run time which makes the method specific and reliable for its intended use in simultaneous determination of Sitagliptin and Simvastatin in bulk drugs.

The assay result obtained by this method is in fair agreement. This method can be use for the determination of Sitagliptin and Simvastatin in bulk drugs of commercial formulations.

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