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DEVELOPMENT AND VALIDATION OF UV SPECTROSCOPIC METHOD FOR THE ESTIMATION OF TICAGRELOR IN TABLET DOSAGE FORM

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ABSTRACT

Simple, precise and accurate zero order derivative spectroscopic method has been developed and validated for the estimation of Ticagrelor in bulk and Pharmaceutical dosage form. The drug shows maximum absorption (λ_{max}) at 253nm in Acetonitrile solution and obeys Beer's law in the concentration range of 5-30 µg/ml. The linearity study carried and regression coefficient was found to be 0.9997 and it has showed good linearity, precision during this concentration range. The % recovery was found to be 99.62-99.99. The LOD and LOQ were found to be 0.073 and 0.2209µg/ml. The % relative standard deviation were found less than 2. According to ICH guidelines the method has been validated for linearity, precision, accuracy, robustness, ruggedness, LOD and LOQ. The developed and validated method can be successfully applied for reliable quantification of Ticagrelor in bulk form and pharmaceutical dosage form.

KEYWORDS: Ticagrelor, Zero order derivative spectroscopy, validation, pharmaceutical formulations.

INTRODUCTION

Ticagrelor is a platelet aggregation inhibitor reduces the rate of thrombotic cardiovascular events in patients with the acute coronary syndrome. Ticagrelor belongs to the category of triazolo pyrimidine which are polycyclic aromatic compounds containing triazole ring fused to a pyrimidine ring. Ticagrelor and its major metabolite reversibly interact with the platelet P2Y12 ADP-receptor to stop signal transduction and platelet activation.[1]

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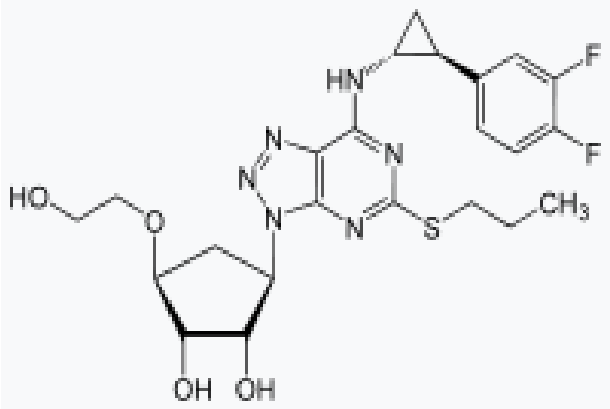

Fig.1: Chemical structure of Ticagrelor.

Literature survey revealed that there were few analytical methods have been reported for the determination of Ticagrelor in pure drug and pharmaceutical dosage forms by using UV spectrophotometric,[2-6] UPLC,[7] HPLC[8-14] and HPTLC[15] so far.

The aim of present work is to develop and validate a novel, rapid, simple, precise and specific Zero order derivative UV Spectrophotometric method for estimation of Ticagrelor in bulk and tablet dosage form.

MATERIALS AND METHODS

Instrument

UV-Visible double beam spectrophotometer, SHIMADZU (model UV-1800) with UV probe software. All weights were taken on analytical balance.

Chemicals

Ticagrelor pure drug was obtained as a gift sample from Micro Labs Ltd, Bommasandra, Bengaluru and its pharmaceutical dosage form Ticagrelor 20 tablet labelled claim 90mg from local pharmacy manufactured by Astra Zeneca Pharma India Ltd.

Solvent
Acetonitrile is used as a solvent.

Selection of analytical wavelength
Appropriate dilutions of Ticagrelor were prepared from standard stock solution and using spectrophotometer solution was scanned in the wavelength range 200-400nm. The absorption spectra obtained and show maximum absorbance at 253nm, as the wavelength for detection (Fig-2).

Preparation of standard stock solution
100mg of Ticagrelor was weighed accurately and transferred in to 100ml volumetric flask and dilute in Acetonitrile up to mark. From this, the solution was further diluted into 100µg/ml and pipette out 0.5,1.0,1.5,2.0,2.5 and 3.0ml into 10ml individual volumetric flask and dilute in Acetonitrile up to mark, this gives 5, 10, 15, 20, 25 and 30µg/ml concentration.

Preparation of sample solution
20 tablets of Ticagrelor marketed formulations were weighed and powdered. A quantity of tablet powder equivalent to 100mg of Ticagrelor was transferred into a 100ml of volumetric flask then it was diluted with Acetonitrile and made up to the mark.

METHOD AND VALIDATION
The method was validated according to ICH guidelines.

RESULTS AND DISCUSSION
Method: Zero order derivative spectroscopy.

Linearity
The linearity of an analytical method is its capacity to show the test results that are directly proportional to the concentration of the analyte in the sample within the range. The linearity was established in the range of 5-30µg/ml was measured at 253nm and absorbance values are shown in table-1. The calibration curve was prepared by plotting graph against the concentration and absorbance and therefore the graph shown in Fig-3. Statistical parameter like slope, intercept, regression equation, correlation coefficient and sandell's sensitivity were determined. (table-2).

Precision
The precision of an analytical method expresses the closeness of a series of individual analyte measurements obtained from multiple sampling of the equivalent sample. Precision was determined by intra-day and inter-day study. Intra-day precision was determined by analysing the same concentration for six times in a same day. Inter-day precision was determined by analysing the same concentration daily for six days. (table-3).

Accuracy
The accuracy of an analytical method says that closeness of test results obtained by that method to the true value. To assess the accuracy of the developed method, recovery studies were carried out at three different levels as 50%, 100% and 150%. In which the formulation concentration kept constant and varied pure drug concentration. (table-4).

Ruggedness
The ruggedness is defined as the reproducibility of results when the method is performed under the variation in conditions. This includes different analyst, laboratories, instruments, temperature etc. Ruggedness was determined between different analyst, the value of %RSD was found to be less than 2. (table-5).

LOD and LOQ
The limit of detection is an individual analytical method is the smallest amount of analyte in a sample which can be reliably detected by the analytical method. The limit of quantitation is an individual analytical procedure is the smallest amount of analyte in a sample which can be quantitatively determined. LOD and LOQ were calculated using formula.

LOD = 3.3(SD)/S and LOQ = 3(LOD)

LOD and LOQ value of were found Ticagrelor be 0.07336 and 0.220µg/ml.

TABLES:
Table 1: Results of calibration curve at 253nm by zero order spectroscopy

SL NO	Concentration in µg/ml	Absorbance ± Standard deviation*
1	0	0
2	5	0.146±0.00098
3	10	0.307±0.00121
4	15	0.466±0.00137
5	20	0.626±0.00116
6	25	0.786±0.00147
7	30	0.946± 0.00121

*Average of six determinations.

Table 2: Regression parameter for Ticagrelor by zero order spectroscopy.

Regression parameter	Results
Range(µg/ml)	5-30
λ_{max}(nm)	253
Regression Equation	Y= 0.0317x+0.0073
Slope(b)	0.0317
Intercept(a)	0.0073
Correlation coefficient(r^2)	0.9999
Sandell's equation	0.0325
Limit of detection(µg/ml)	0.0733
Limit of quantitation(µg/ml)	0.2200

Table 3: Determination of precision results for Ticagrelor at 253nm by zero order spectroscopy.

Concentration (µg/ml)	Intra-day Absorbance ±Standard deviation*	%RSD**	Inter-day Absorbance ±Standard deviation*	%RSD**
5	0.147±0.001	0.6802	0.150±0.00153	1.016
10	0.307±0.00153	0.4966	0.310±0.001	0.322
15	0.466±0.00153	0.3276	0.469±0.00058	0.122
20	0.626±0.00153	0.2439	0.627±0.00153	0.243
25	0.786±0.002	0.2544	0.79±0.001	0.126
30	0.947± 0.00058	0.0609	0.949± 0.001	0.105

*****Average of six determinations, **percentage relative standard deviation.

Table 4: Determination of Accuracy results for Ticagrelor at 253nm by Zero order spectroscopy.

Spiked Levels	Amount of Sample (µg/ml)	Amount of Standard (µg/ml)	Amount Recovered	% Recovery ±Standard deviation*	%RSD**
50	10	5	14.98	99.90 ±0.326	0.326
100	10	10	19.99	99.99 ±0.325	0.325
150	10	15	24.90	99.62 ±0.193	0.193

*****Average of six determinations, **percentage relative standard deviation.

Table 5: Determination of Ruggedness results for Ticagrelor at 253nm by Zero order spectroscopy.

Analysts	Analyst 1	Analyst 2
Mean absorbance	0.467	0.466
±Standard deviation*	0.001	0.0015
%RSD	0.214	0.327

*****Average of six determinations, **percentage relative standard deviation.

FIGURES

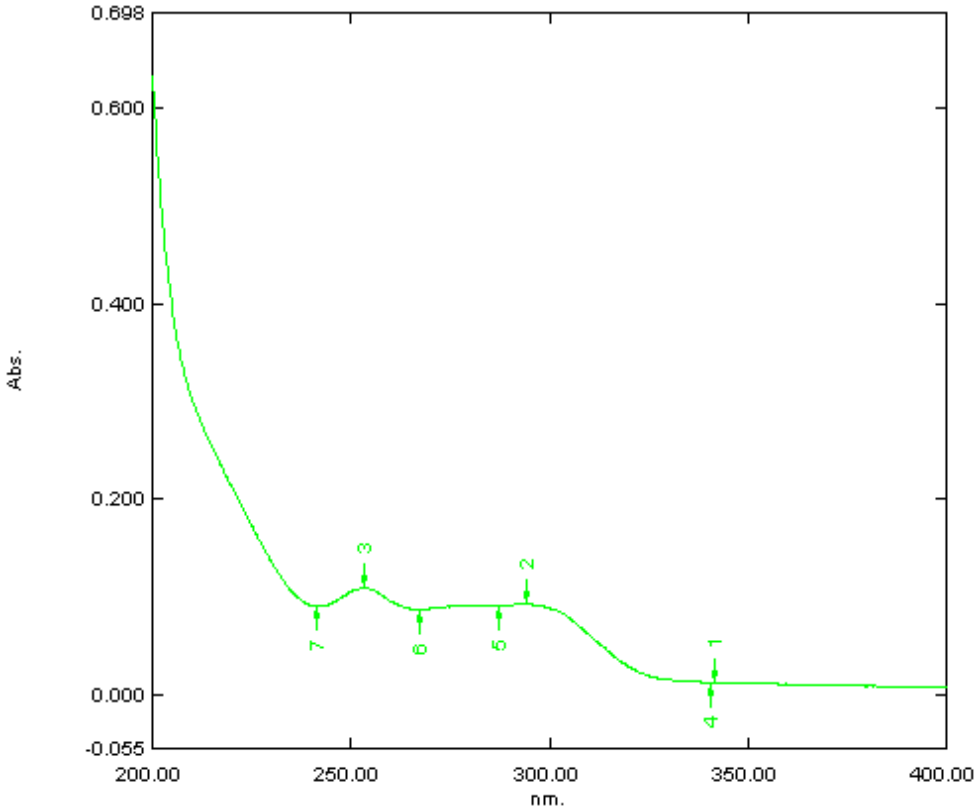

Fig. 2: Zero order spectrum of Ticagrelor at 253nm.

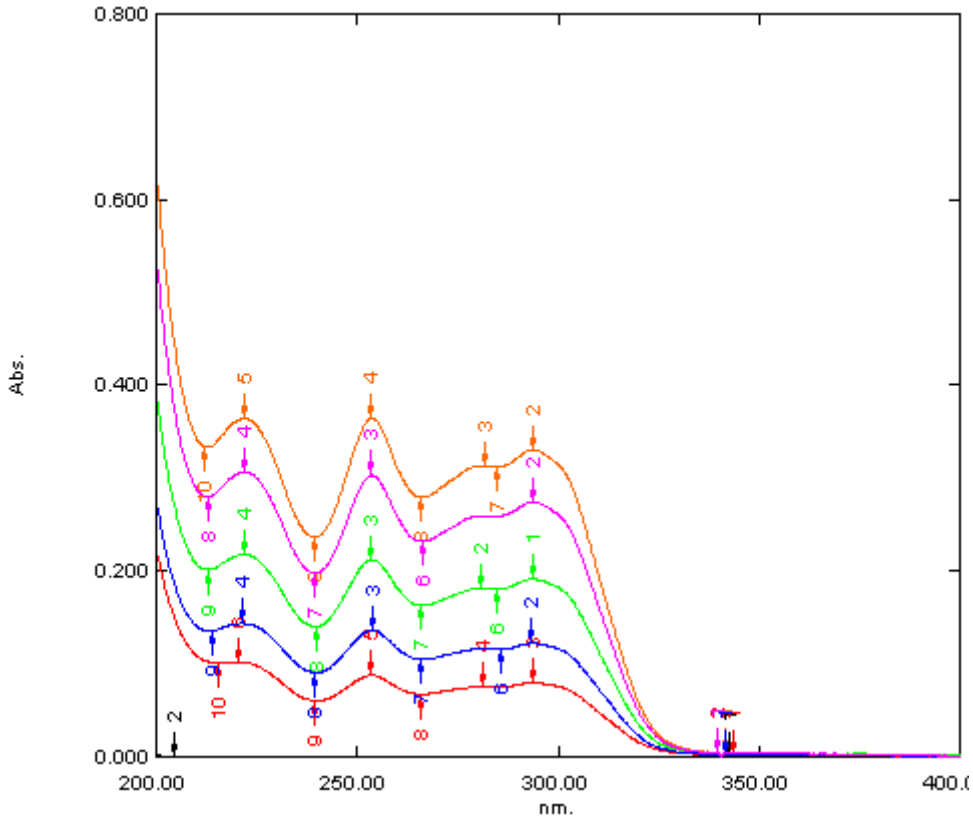

Fig. 3: Zero order overlain spectra of Ticagrelor showing absorbance at 253nm.

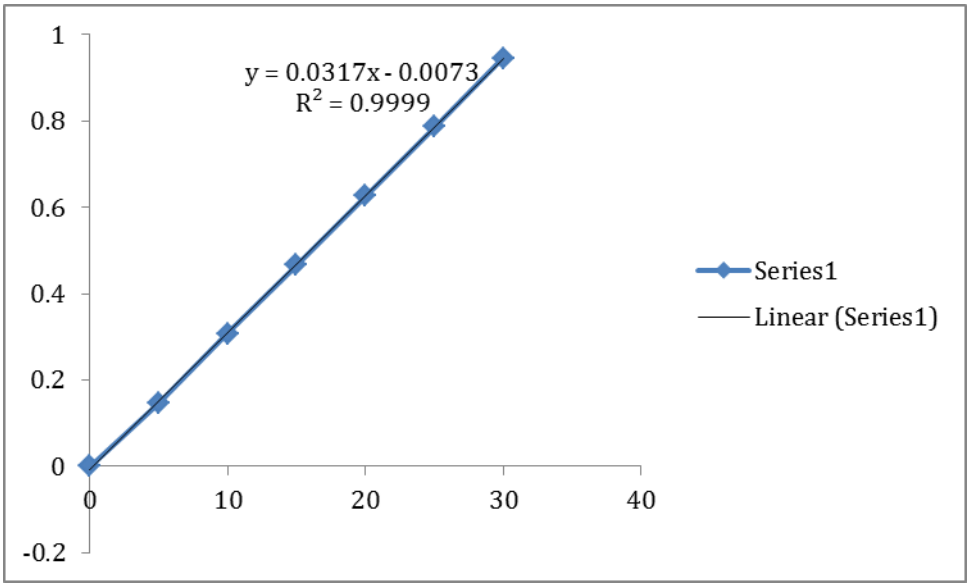

Fig. 4: Calibration curve of Ticagrelor by zero order spectroscopy.

CONCLUSION

As per ICH guidelines, the present analytical was carried and met the acceptance criteria. It was concluded that the developed analytical method was simple, specific, accurate, economical and sensitive and can be used for routine analysis of Ticagrelor in bulk drug and in pharmaceutical dosage forms.

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REFERANCE

1. Swetha V, Prasad SV, Akhila Y. Analytical method development and validation of stability indicating assay method of Ticagrelor tablets by using RP-HPLC. World Journal of Pharmaceutical and Medical Research, 2017; 3(10): 235-41.
2. Souri E, Hamid KM, Tehrani MB, Jalali Zadeh H. Spectrophotometric methods for determination of Ticagrelor in dosage forms. Asian Journal of Pharmacy and Pharmacology, 2017; 3(5): 172-76.
3. Pandya D, Patel M, Ghediya R, Shah A, Khunt R. UV-Vis spectrophotometric assay determination of oral antiplatelet Ticagrelor drug in Pharmaceutical formulation: Application to content uniformity. Journal of Chemical and Pharmaceutical Research, 2016; 8(1): 316-21.
4. Narware H, Malviya K, Sirohi B, Omray LO. UV spectrophotometric methods for estimation of Ticagrelor in Pharmaceutical formulations. Asian Journal of Pharmaceutical Education and Research, 2018; 7(4): 94-106.
5. Gupta A, Jadhav V, Jain A. Analytical method development and validation of Ticagrelor from bulk and formulation. Asian Journal of Pharmaceutical Research, 2019; 9(3): 141-46.
6. Kumar NA, Swathi PR, Sharmila D, Sharmila SK, Pawar AK. A Validated stability indicating method of UV-spectrophotometry for the estimation of Ticagrelor in bulk & marketed formulation. Der Pharmacia Lettre, 2016; 8(19): 309-15.
7. Omaima J, Sharma JV. Development and validation of stability indicating UPLC method for the estimation of Ticagrelor in bulk and its tablet dosage form. Journal of Drug Delivery and Therapeutics, 2019; 9(1): 201-05.
8. Swetha V, Prasad SV, Akhila Y. Analytical method development and validation of stability indicating assay method of Ticagrelor tablets by using RP-HPLC. World Journal of Pharmaceutical and Medical Research, 2017; 3(10): 235-41.
9. Tabassum K, Sarvesh R. Analytical method development and validation studies of Ticagrelor tablets by RP-HPLC. International Journal of Applied Pharmaceutics, 2017; 9(4): 10-21.
10. Kulkarni PR, Gajare GK. Development and validation of RP-HPLC method for estimation of Ticagrelor in bulk form. International Journal of Research in Pharmacy and Chemistry, 2016; 6(4): 733-37.
11. Cruz D, Babu A, Joshy E, Aneesh TP. Bioanalytical method development and validation Of Ticagrelor by RP-HPLC. International Journal of Applied Pharmaceutics, Innovare Academics Sciences Pvt. Ltd, 2017; 9(3): 51-54.
12. Shane NL, Chamle AH, VasanthaRaju SG, Pai A, Muddukrishna BS. Method development and validation for the estimation of Ticagrelor in bulk and comparison with other published methods. Journal of Global Pharma Technology, 2016; 8(12): 1-6.
13. Mehta AR, Maheshwari DG. Development and Validation of first UV Spectroscopic method and RP-HPLC method for Simultaneous estimation of Rivaroxaban and Ticagrelor in synthetic mixture.

Journal of Global Trends in Pharmaceutical Science, 2018; 9(2): 5275-97.
14. Bueno LM, Manoel JW, Giordani CF, Mendez AS, Volpato NM, Schapoval EE, Steppe M, Garcia CV. HPLC method for simultaneous analysis of Ticagrelor and its organic impurities and identification of two major photodegradation products. European Journal of Pharmaceutical Sciences, 2017; 15: 97:22-9.
15. DA S, Shunmuganathan Elakkiya L, Mehta FA, Chhalotiya UK. Article Details Stability indicating HPTLC method for the estimation of Ticagrelor in bulk and in Pharmaceutical dosage form.