VALIDATED SPECTROPHOTOMETRIC METHOD OF ROSUVASTATIN ESTIMATION USING HYDROTROPICSOLUBILIZATION

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Abstract:

Urea, sodium salicylate, sodium citrate, sodium acetate, sodium benzoate and nicotinamide. concentrated aqueous hydrotopic solution have been seen to increase the aqueous solubility of numerous medication that aren't vary water-soluble. In order to improve the first solute's solubility in water, a second solute must be added in high quantities, which eliminates the need for organic solvents. These hydrotropes are inexpensive and non-polluting. In the current study, Rosuvastatin, a poorly-water soluble medication, was hydrotropically solubilized for spectrophotometric analysis using 1M sodium benzoate. At 244nm, rosuvastatin demonstrates maximal absorption. Beer's law was discovered to be upheld for concentration. There is no interference from conventional pharmaceutical additives or diluents in this approach. RSV correlation coefficient was (or "r" value) 0.9994. the analysis finding have been confirmed in accordance with ICH criteria, with Rosuvastatin calcium, the percentage recovery ranges from 99.97 to 99.98%. The procedure is accurate, exact and cost-effective.

Key words: Rosuvastatin, Hydrotropy, Solubility, Sodium benzoate, Spectrophotometric.

Introduction:

- Rosuvastatin calcium is synthetic HMG-CoA reductase inhibitor. It is chemically dihydroxy monocarboxylic acid that is (6E)-7-{4-(4-fluorophenyl)-2-[methyl(methylsulfonyl)amino]- 6-(propan-2-yl)pyrimidin-5-yl} hept-6-enoic acid carrying two hydroxy substituents at positions 3 and 5 (the 3R,5S-diastereomer)(fig.1).
- Rosuvastatin is orally regulated as calcium salt. The rate limiting enzyme that converts HMG-CoA to mevalonate a precursor of cholesterol and there by check the synthesis of cholesterol. It is used to treatdyslipidemia and hypercholesterolemia.
- Few solid phase extraction approaches, including as tandem MS, HPTLC, and Simple UV, have been described for the quantification of RSV in pharmaceutical formulation and biological fluids, accordingto the review of literature.

- The term "hydrotropy" describes a chemical molecule's capacity to make another compound more soluble in water when it is present in concentrated form. The most well known examples of hydrotropicagents, which have been used to solubilize a vast variety of poorly-water soluble compounds are sodium benzoate, sodium salicylate, sodium acetate, sodium glycinate, sodium ascorbate, niacinamide, urea and sodium citrate.
- For the measurement of the poorly water-soluble medication Rosuvastatin in pharmaceutical formulations, a UV/VIS absorption spectrophotometric approach has been devised.
- RSV aqueous solubility was significantly improved in 1M sodium benzoate. The main goal of the current study was to use a hydrotropic solution instead of corrosive organic solvents to extract themedication from the dosage form.

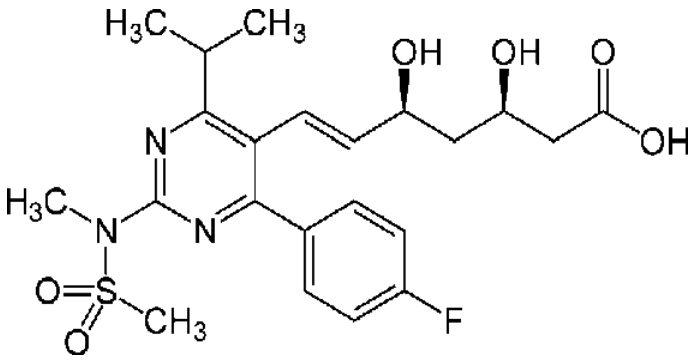

Fig.1 Rosuvastatin chemical structure

Materials and Techniques:

Apparatus: A double beam UV- Visible Spectrophotometer, (LAB INDIA-3000) with UV WIN software and 1cm quartz cell in the wavelength range of 200-800nm was used for spectrophotometric measurements. Drug and the reagents were weighed using Sartorius weighing balance.

Chemicals and Reagents: The chemicals and reagents are suitable for use in analytical work. 1M Sodium Benzoate, Double distilled water was used throughout the experiment. Rosuvastatin was procured from"strides pharma science limited".

Preparations of reagents and solution:

Preparation of 50ml of 1M Sodium Benzoate: 14.1g of sodium benzoate were prepared withdistilled water separately in 50ml standard flask.

Stock Solution: 50mg of Rosuvastatin crude was dissolving with 50ml of 1M Sodium Benzoate andmack up with distilled water in 100ml standard flask.

Standard working solution: Take 1ml of the stock solution and combine it with distilled water(10ug/ml) in 50ml standard flask.

Aliquots of drug solution corresponding to 0.4-2.0ml and volume made up with

distilled water. At **244nm**, the absorbance of these solutions are measured (fig.2).

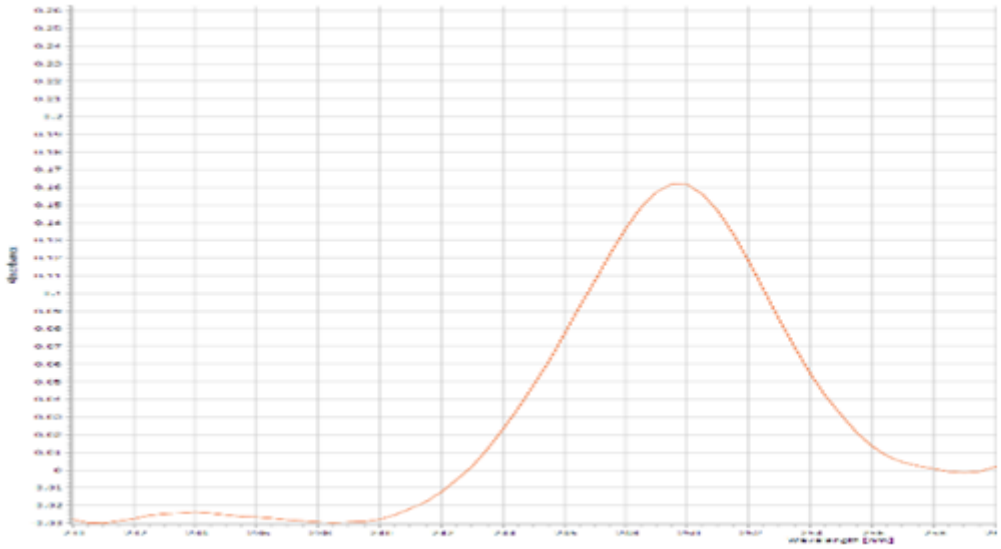

Fig.2 Rosuvastatin scanned in UV range (in sodium benzoate)

Method Validation:

Linearity:

The standard calibration curve was drawn between the absorption of the reaction product and the concentrationof drug being studied (fig.4). Over the range of 0.2-0.5µg/ml, a linear relationship was obtained, which obeys the Beer-lambert's law.

Table:3 Table for calibration plot

s.no	Volume of stock solution	Concentration of RS µg/ml	Absorbance
1.	0.4	2	0.0691
2.	0.6	4	0.1145
3.	0.8	6	0.1745
4.	1	8	0.2312
5.	1.2	10	0.2924
6.	1.4	12	0.3523
7.	1.6	14	0.4074

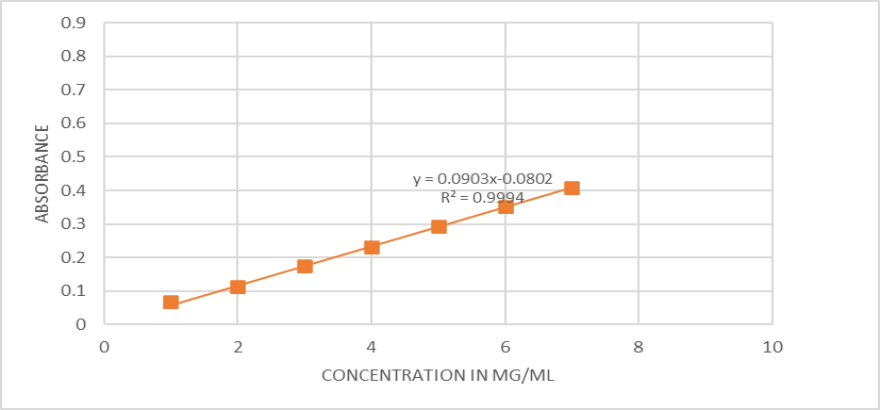

Fig.4 Rosuvastatin calibration plot

Table:5 Rosuvastation optical properties for developed method

s.no	Parameters	
1.	®	0.9994
2.	Y=aX+c	0.0249 µg/cm2/0.001 Abs unit
3.	Molar absorptivity	9341x10⁴ L/mol/cm
4.	Sandell´s sensitivity	0.0249 µg/cm2/0.001 Abs unit

Method for tablet formulation analysis:

Two commercial formulation Rosuvas(sun pharmaceutical) and Rosurise(carise pharmaceutical) were purchased from neighbourhood market. In a glass mortar, the tablets were finely ground after the average weight of each and everyone was determined and then we take the amount of 0.1g and dilute it with the 1M Sodium Benzoate for analysis, filter and the amount of drug present in the sample solution was determined by measuring the absorbance at 244nm and using the calibration curve's slope and intercept (Table.5). To ensure its reproducibility, the expriment were conducted three more times. The finding from the examination of tablet formulations are listed below (Table.6).

TABLE.6 DATA RECOVERY STUDY

s.no	Brand name	Spiked amount	Amount percent	%Recovery
1.	Rosuvas	10	49.9	99.98 ±0.01539
2.	Rosurise	10	49.8	99.97 ±0.01432

TABLE.7 PERCENTAGE RECOVERY

Brand	Conc	Spiked	Found	SD	%Recovery
Rosuvas	3	10	9.92	0.00068	99.97
	5	10	10.07	0.00041	100
Rosurise	3	10	9.957	0.00033	99.68
	5	10	9.985	0.00041	99.92

Accuracy and precision:

The standard deviation of a series of data is typically used to express the accuracy and precision of an analytical method. Three different concentration of RSV (3, 5 and 7 µg/ml) created from stock solution were used to study the method's repeatability. This high level of accuracy made it appropriate for quality control examination of the medication under study. The inter-day and intra-day precision studies of RSV were carried out by estimating the corresponding responses three times on the same day and on three different ways (1^{st}, 2^{nd} and 5^{th} day) for three different concnetration of RSV (3, 5 and 7 µg/ml) and the result are reported in terms of relative standard deviation in (Table.8 and Table.9).

TABLE.8 INTRA-DAY PRECISION

conc	Absorbence at 244nm			Average	SD	%RSD
	0hr	1.5hr	3hr			
3	0.1242	0.122	0.123	0.12	0.0009	0.73
5	0.2284	0.2275	0.2262	0.23	0.0009	0.40
7	0.3854	0.3842	0.3831	0.38	0.0009	0.24

TABLE.9 INTER-DAY PRECISION

conc	Absorbence at 244nm			Average	SD	%RSD
	1^{st} day	2^{nd} day	5^{th} day			
3	0.1278	0.1264	0.1257	0.13	0.0009	0.69
5	0.24	0.24	0.24	0.24	0.00	0.36

	56	42	35		09	
7	0.39 51	0.39 42	0.39 36	0.39	0.00 06	0.16

Limit of detection (LOD):

The lowest amount of analyte in a sample that can be detected but not necessarily quantitated as an accurate value is the detection limit of a specific analytical process. By using the suggested method, the LOD ofRSV was discovered to be 0.35µg/ml.

Limit of quantification (LOQ):

The lowest concentration of analye in a sample that can be quantitatively measured with an acceptable degree of precision and accuracy is the quantitation limit of a specific analytical process. By using the suggested approach, the LOQ of RSV was discovered to be 1.11µg/ml.

Results and Discussion:

Organic solvents are used in the quantitative assessment of medication with poor water solubility. The high cost, volatility, and toxicity of organic solvents are some of its main downsides. In the current study, hydrotropic solubilization is used to improve the medication Rosuvastatin low water solubility in tablet dosage forms. According to the result of solubility studies, Rosuvastatin was more soluble in water than distilled water by a factor of more than five when it dissolved in a 1M Sodium Benzoate solution. Rosuvastatin was therefore extracted from the fine tablet formulation powder using this solution. The use of organic solvents in analysis can be greatly reduced by making wise hydrotropic agent selections. It is clear that the amount estimated and the claims made by the makers agree fairly well. The mean % label claim that Rosuvas and Rosurice respective values of 99.98 and 99.97 (Table.6) are very close to 100 with low values for standard deviation and standard error, validating the correctness of the proposed stratergy. The suggested method's accuracy and precision were further supported by the mean percentage recovery values, which ranged from 99.98 and 99.97 are very close to 100 with low values for standard deviation. The molar absorptivity for the suggested approach to determine Rosuvastatin was $9341x10^4$ L/mol/cm, and the sandell's sensitivity was 0.0249 µg/cm2/0.001 Abs unit, with a correlation value ® of 0.9994, linear regression of absorbance on concentration produced the equation Y=0.0249 µg/cm2/0.001 Abs unit. Also the established method is affordable, straightforward, acurate and quick; as a result, it may be used for regular analysis to estimate the presense of Rosuvastatin in commercial formulation and biological fluid.

Conclusion:

The calibration curve for Rosuvastatin was linear in the concentration range of 0.2-0.5g/ml, with a correlation coefficient 0.9994. The method accuracy and precision were determined and statistically evaluated. The approach demonstrated good recovery (% RSD less than 2) and reproducibility. The method was discovered to be quick, specific, precise and accurate. This approach can be used successfully for routine Rosuvastatin analysis. The proposed method correctness was confirmed by executing accuracy studies, which revealed the accepted results. The proposed method precision was validated by completing intraday and interday precision test. The Rosuvastatin determination method was validated.

Conflict of interest:

The author declares that there are no conflict of interest regarding the publication of the paper.

Abbrevations:

1. ICH	–	INTERNATIONAL COUNCIL FOR
2. RSV		
3. UV	–	HARMONIZATIONROSUVASTATIN
4. FDA		
	–	ULTRAVIOLET
	–	FOOD AND DRUG ADMINISTRATION
5. HMG-CoA	–	HYDROXYMETHYLGLUTARYL-COENZYME A
6. NS	–	NORMAL SALINE
7. API	–	ACTIVE PHARMACEUTICAL INGREDIENT
8. SD	–	STANDARD DEVIATION

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