Research Article

Development and Validation of UV Spectrophotometric Method for Simultaneous Determination of Rosuvastatin Calcium and Aspirin in its Pure and Pharmaceutical Dosage Forms

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ABSTRACT

Development and validation of two simple, rapid, precise, accurate and sensitive UV spectrophotometric methods for the simultaneous estimation of Rosuvastatin calcium and Aspirin in bulk and in capsule dosage form. The methods are based on the measurement of absorbance of Rosuvastatin calcium and Aspirin at 241nm and 296nm respectively. The linearity of the calibration curves for Rosuvastatin calcium and Aspirin in the desired concentration range is good (r^2 =0.999) by these method. The results of analysis have been validated statistically and recovery studies confirmed the accuracy of proposed methods. These methods were successfully applied to the routine determination of these drugs in bulk and in its pharmaceutical dosage form.

Keywords: Rosuvastatin calcium; Aspirin; area under curve; UV spectrophotometry.

1. INTRODUCTION

Rosuvastatin (RSV) is the calcium salt of (E)-7-[4-(4-fluorophenyl)-6-isopropyl-2-[methyl(methylsulfonyl)amino]pyrimidin-5-yl](3 R,5S)-3,5-dihydroxyhept-6-enoic acid. RSV is a selective and competitive inhibitor of 3-hydroxy-3-methylglutaryl-coenzymeA s(HMG-CoA) reductase, the rate-limiting enzyme that converts 3-hydroxy-3-methylglutaryl coenzyme A to Mevalonate, a precursor of cholesterol. RSV is a member of the class of statins, used to treat hypercholesterolemia and related conditions and to prevent cardiovascular disease. It increases the number of hepatic LDL (Low Density Lipoprotein) receptors on the cell surface to enhance uptake and catabolism of LDL. Secondly, RSV inhibits hepatic synthesis of VLDL (Very Low Density Lipoprotein), which reduces the total number of VLDL and LDL particles.

Aspirin is also known as acetylsalicylic acid is a salicylate drug, often used as an analgesic, antipyretic, anti-inflammatory and also has an antiplatelet effect by inhibiting the production of thromboxane, which under normal circumstances binds platelet molecule together to create a patch over damage of the walls within blood vessels. Chemically it is 2-acetoxybenzoic acid and is a nonsteroidal anti-inflammatory drug (NSAIDs) and shows inhibition of the enzyme cyclooxygenase and it is official in Indian Pharmacopoeia, The United States Pharmacopeia and British Pharmacopoeia.

A survey of literature has not revealed any UV-visible spectrophotometric method for simultaneous determination of Rosuvastatin calcium and Aspirin. However few HPLC, capillary zone electrophoresis, spectrophotometric, HPTLC and GC have been reported for the drugs individually and in combination with other drugs.

2. MATERIALS AND METHODS

MATERIALS

The bulk drugs of RSV and ASP were obtained as gift samples from Glenmark Pharmaceutical Ltd Mumbai and Cipla Pharmaceutical Ltd Daund respectively. All analytical grade chemicals and solvents were purchased from Merck, India.

Equipment

A Jasco UV- Visible V-530 spectrophotometer with data processing system was used for all absorbance measurements. UV spectra of reference and sample solutions were recorded in 1 cm quartz cells at a scan speed 100nm per min.

3. PROCEDURE

Preparation of standard stock solutions

Standard stock solutions of RSV and ASP were prepared by dissolving 10mg each accurately weighed of standard RSV and ASP in 0.1 N NaOH and made the volume up to 100ml with same solvent in 100ml volumetric flask. Working standard solutions were prepared by diluting aliquot portion of standard stock solution of each drug to give concentration 4µg/ml and 30µg/ml of RSV and ASP respectively.

Calibration curve

Each working standard solution was scanned between the range 200-400 nm. The calibration curves for RSV and ASP were prepared in the concentration range of 2-10 µg/ml and 10-50µg/ml respectively.

Method I: Simultaneous equation method

In quantitative determination of two drugs by these method two λs that is 241nm as λmax of RSV and 296nm as λmax of ASP were selected at which both drugs have absorbance. A set of two simultaneous equations were formed using absorptivity coefficient at selected wavelengths.

The concentrations of two drugs in the mixture were calculated using set of two simultaneous equations:

$C_{RSV} = A_2 \times ay_1 – A_1 \times ay_2 / ax_2 \times ay_1 – ax_1 \times ay_2$ …… (1)

$C_{ASP} = A_1 \times ax_2 – A_2 \times ax_1 / ax_2 \times ay_1 – ax_1 \times ay_2$……. (2)

Where,

ax_1 and ax_2 are absorptivities of RSV at (λ1)and (λ2) respectively.

ay_1 and ay_2 are absorptivities of ASP at (λ1) and (λ2) respectively.

A1 and A2 are Absorbances of mixed standard at (λ1) and (λ2) respectively.

C_{RSV} and C_{ASP} are concentration of RSV and ASP respectively.

Method II: Area under curve method

From spectra, area under the curves was measured in range of 238-244nm and 293-299nm. The absorptivity coefficients were determined for both the drugs at both the wavelength range and following equation were made.

$A_1 = 0.9571C_{RSV} + 0.3429C_{ASP}$……. (3) ($\lambda_{238-244}$)

$A_2 = 4.041C_{RSV} + 3.7288C_{ASP}$…….. (4) ($\lambda_{293-299}$)

Where A_1 and A_2 are area under the curve of sample solution at the wavelength range 238-244 nm and 293-299nm respectively and C_{RSV} and C_{ASP} are concentrations of Rosuvastatin calcium and Aspirin respectively. The concentrations of both the drugs in the mixture were determined by equation (3) and (4).

Analysis of capsule formulation

Twenty capsules were weighed accurately and content were emptied. A quantity of powder equivalent to 10mg RSV and 75mg ASP was weighed, transferred to 100ml volumetric flask, dissolved in 100ml 0.1N NaOH. The mixture was ultrasonicated for 20 min. The solution was filtered through whatmann filter paper no. 41 and suitably diluted with distilled water to have 4 µg/ml and 30µg/ml of RSV and ASP respectively. Samples were analysed by the proposed methods.

Recovery studies

The accuracy of proposed methods was checked by recovery study by addition of standard drug solution to preanalysed sample solution at three different concentration levels (80%, 100% and 120%) within the range of linearity for both the drugs. The basic concentration level of sample solution selected for spiking of the drugs standard solution was 4µg/ml of RSV and 30µg/ml of ASP for both the methods.

4. RESULT AND DISCUSSION

Literature survey reveals not a single method has been reported for simultaneous analysis of the RSV and ASP by UV spectrophotometric method. So, the proposed methods for simultaneous estimation of RSV and ASP in combined dosage form were found to be new, simple, rapid, accurate and economic.

For both the methods, linearity was observed in the concentration range of 2-10µg/ml and 10-50µg/ml for RSV and ASP respectively. Marketed brand of capsule was analysed and amount of drug determined by proposed method ranges from 98 to 102% as shown in table no 1. The proposed method was validated as per ICH guidelines. The accuracy of method was determined at 80, 100 and 120% level. The percentage recovery ranges from 97.37 to 101.62% for both methods. Precision was calculated as interday and intraday variations (% RSD is minimum) for both drugs.

The two methods can be successfully used for simultaneous estimation of RSV and ASP in combined dosage form.

5. CONCLUSION

The proposed methods have proved to be simple, rapid, precise, accurate sensitive and economical and are suitable for simultaneous quantification of RSV and ASP in bulk and in pharmaceutical dosage forms.

Table 1: Statistical parameters

Parameters	RSV	ASP
Linearity range	2-10 µg/ml	10-50 µg/ml
Slope	0.0462	0.0284
Intercept	0.006	0.0184
Correlation Co-efficient	0.997	0.998
Intraday Precision (% assay)	101.29	98.75
Intraday Precision (% R.S.D.)	0.0043	0.0181
Interday Precision (% assay)	98.04	98.17
Interday Precision (% R.S.D.)	0.00448	0.0455

RSV – Rosuvastatin, ASP-Aspirin

Table 2: Analysis of capsule formulations

Method	Formulation	Label claim mg/dose		Amount found mg/dose		%Recovery ± SD*
Simultaneous Equation Method	Capsules	10	75	10.1	75.5	101.66%±0.0178 101.36%±0.0132
Area Under Curve Method	Capsules	10	75	10.08	75.2	100.08%±0.45 100.52%±0.0088

Capsule formulation containing RSV 10 mg and ASP 75mg per dosage.
*= Average of 6 determinations

Table 3: Result of recovery studies by the proposed methods

Formulation used	Recovery level	Recovery of	% mean recovery*,% RSD	
			Simultaneous Equation Method	Area Under Curve Method
Capsule (Unistar*)	80%	RSV	97.37, 0.013	99.62, 0.022
		ASP	100.84,0.116	100.64, 0.017
	100%	RSV	99.37, 0.013	99.37, 0.0135
		ASP	100.54, 0.02	101.4, 0.0135
	120%	RSV	97.6, 0.0137	101.62, 0.008
		ASP	100.61, 0.39	100.65, 0.025

*= Average of 6 at each level of recovery

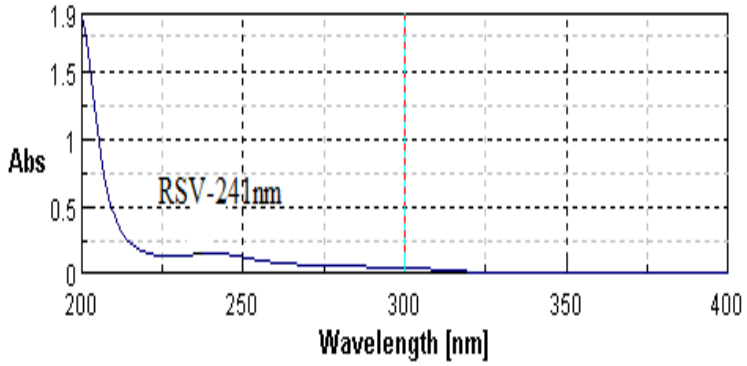

Fig. 1: UV Spectrum of RSV

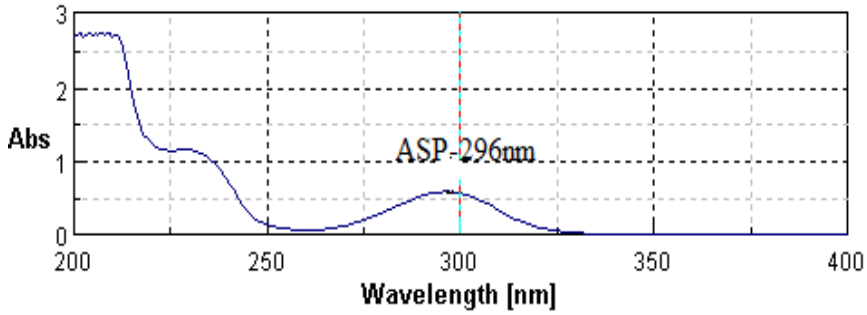

Fig. 2: UV Spectrum of ASP

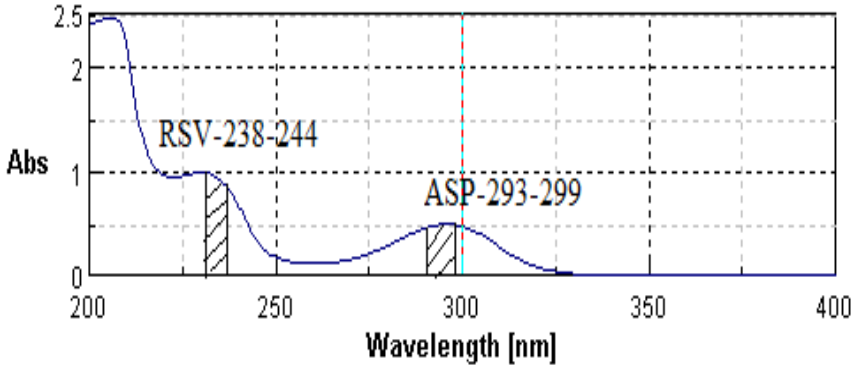

Fig. 3: AUC spectra for mixture

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