A SENSITIVE HPLC METHOD FOR SIMULTANEOUS ESTIMATION OF TAMSULOSIN HYDROCHLORIDE AND ITS IMPURITY

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ABSTRACT

Tamsulosin hydrochloride is used to treat the symptoms of an enlarged prostate, a condition technically known as benign prostatic hyperplasia or BPH. The analyte was resolved by using Mobile phase (Potassium Dihydrogen Orthophosphate and Acetonitrile) at the flow rate of 1.2 Ml/Min. on Isocratic HPLC system consisting of Jasco Make UV visible Detector of model UV 1575 and Jasco make HPLC pump of model PU 1580. An ODS C- 8 RP Column (4.6mm ID, 250mm L, particle size 5 Micron, at wavelength of 280 Nm. The linearity range was found to be 0.4 Ml/Ml for Tamsulosin and 0.12 mg/ml to 2.0 mg/ml for its Impurity. The proposed method is simple, accurate, rapid and selective. Percent Relative standard Deviation was found to be very low, below 2.0%, which indicates that method is highly precise and specific. Short Analysis time (≤10 min.) coupled with simplicity and ease of operation warrants use of the given method for analysis of Tamsulosin Hydrochloride along with its impurity as stated above in Bulk. Therefore, method can be useful in routine Quality Control Analysis in bulk drugs.

Keywords: Determination, tamsulosin hydrochloride, impurity, HPLC impurity- 5-(2R)-2-Aminopropyl)-2-methoxybenzene sulphonamide.

INTRODUCTION

Tamsulosin hydrochloride is used to treat the symptoms of an enlarged prostate, a condition technically known as benign prostatic hyperplasia or BPH (Hidehiro Kakizaki, 2003). The walnut-sized prostate gland surrounds the urethra (the duct that drains the bladder). If the gland becomes enlarged, it can squeeze the urethra, interfering with the flow of urine (Kentaro Ichioka, 2004). This can cause difficulty in starting urination, a weak urine flow, and the need to urinate more frequently or on urgent basis. Tamsulosin hydrochloride does not shrink the prostate. On the contrary, it relaxes the muscle around it, thereby allowing the free flow of urine and decreasing the symptoms leading to disease (Matsushima H, 2004). Several methods have been cited in various literatures but the prescribed method has unique advantage over it, as it not only analyses the product but also Impurity present in Bulk and Formulated Dosages (Michel, 2001). This method can even be employed in routine determination of Tamsulosin Hydrochloride in routine Quality Control in process and finished stages. Novelty of this method is its use in Impurity Profiling as it is statistically proved a better choice of An Analyst. Impurity Profiling is the common name of the Analytical activities, the aim of which is the detection, identification/structure elucidation and quantitative determination of organic and inorganic impurities, as well as Residual Solvents present in Bulk Drugs and Formulation dosages. Since this is the unique way to characterize quality and stability of Bulk Drugs and Formulated Dosages, this forms the core activity in modern drug analysis (Nayan Kumar Mohanty, 2003). Due to rapid development of various analytical methodologies available for this purpose there is also an increase in the demand as regards to the purity of the drugs therefore it is a vital task to present a summary of the problems which can be encountered and the various possibilities offered by modern analytical Chemistry for their solution (Rolan, 2003 and Rafael, 1999).

EXPERIMENTAL

Reagent and chemicals

Tamsulosin Hydrochloride, 5-(2R)-2-Aminopropyl)-2-methoxybenzene sulphonamide were procured from Aarti Drugs Limited, Mumbai with its certificate of analysis. Potassium Dihydrogen Orthophosphate, Aceto Nitrile water were used of HPLC grade purity. Ortho phosporic acid was used of Analytical Grade (AR).

Apparatus

A Jasco HPLC-1575 Series Chromatograph equipped with Intelligent Pump, UV Detector Jasco 1575 and autosampler Jasco AS 1555 was used. The column used was **s**tainless steel C-18, 250 x 4.6mm, 5 Micron, Lichrosphere operating at room **t**emperature. The elution

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Table 1: Recovery

Compound	Run	A	B	X	Mean	SD	CV	95% CL
Impurity	1	0.012	0.012017	1.00140947	0.998114	0.004107	0.411447	0.00754
	2	0.012	0.011993	0.99941821				
	3	0.012	0.011922	0.99351302				
Tamsulosin Hydrochloride	1	0.01	0.009977	0.99773973	1.000989	0.003109	0.310555	0.005707
	2	0.01	0.010039	1.00393456				
	3	0.01	0.010013	1.00129397				

Where A = Actual concentration taken for analysis: B- Recovered concentration, X = B/A; (%Recovery = X*100); Mean – Average of 3 (x) Injection; SD Standard Deviation, CV Coefficient of variation; 95% CL= Confidence Limit at 95%.

was carried out isocratically at flow rate of 1.2 Ml/min. using Potassium Dihydrogen Orthophosphate buffer and Acetonitrile (50:50) and pH adjusted with 10% Ortho Phosphoric acid to 5.00 (±0.2) as mobile phase. The detector was set at 275 Nm. The responses of peak area were recorded and integrated using Browin Chromatographic Software.

Stationary phase

Lichrosphere C8, (5 Micron, 25 Cm, 4.6mm) was used.

HPLC conditions

Buffer Solution- Weigh accurately about 3.4005 gm of Potassium Dihydrogen Orthophosphate in a 500 ml of volumetric flask, add 250 to 300 ml of Milli Q water, and dissolving it with the aid of sonication.

Mix 50 parts of buffer with 50 parts of Acetonitrile. Adjust the pH of this solution to 5.0±0.02 with 10% Orthophosphoric acid, and dilute up to the mark with Milli Q water, check the pH to 5.0 (±0.2). Sonicate and filter it through 0.45 micron filter paper and further degas it by sonication.

Preparation of test solution for the analysis of tamsulosin hydrochloride

Amber colored glassware must be used for preparing this solution. Dissolve 50 Mg of the sample in the mobile phase and dilute it to 100ml with mobile phase.

Reference solution A

Dissolve 10 Mg of 5-(2R)-2-Aminopropyl)-2-methoxy-benzene sulphonamide standard, in the mobile phase and dilute to 100 Ml with **m**obile phase.

Reference solution B

Weigh accurately 100 Mg Tamsulosin Hydrochloride standard, transfer it into 100 ml volumetric flask, to it add 1.0Ml of solution A into it and dilute it to 100 ml with Mobile phase.

System suitability

Table 3 shows system suitability study conducted as per r USP 27 System, suitability tests were carried out on freshly prepared Reference solution B to check the various parameters such as efficiency, retention time, and peak tailing which were found to comply with USP requirements.

The instrumental precision as determined by six successive injections of the reference solution B give RSD below 2% of Retention Time, area and resolution between these two peaks was more than 1.0, Column efficiency for many impurity was 1669, and for Tamsulosin Hydrochloride it was 3346 theoretical plates.

Calculation of results

1. Tamsulosin hydrochloride content

$$\text{Tamsulosin Hydrochloride Content} = \frac{A_{Samp.} \times W_{Std.}}{A_{Std.} \times W_{Samp.}} \times P$$

$A_{Samp.}$ = Area of Tamsulosin HCl peak in an injection of sample.

$A_{Std.}$ = Mean Area of Tamsulosin HCl peak in injection of analytical standard solution.

$W_{Samp.}$ = Weight of the sample taken to prepare relevant sample solution (in mg)

$W_{Std.}$ = Weight of Tamsulosin HCl reference standard taken to prepare analytical standard solution (in mg)

P = Potency of Tamsulosin HCl reference standard (On dried Basis).

2. 5-(2R)-2-aminopropyl)-2-methoxybenzene sulphonamide content

$$\text{5-(2R)-2-Aminopropyl)-2-methoxy- benzene sulphonamide} = \frac{A_{Samp.} \times W_{Std.}}{A_{Std.} \times W_{Samp.}} \times P$$

$A_{Samp.}$ = Area of 5-(2R)-2-Aminopropyl)-2-methoxy-benzene sulphonamide Peak in an injection of sample.

$A_{Std.}$ = Mean Area of 5-(2R)-2-Aminopropyl)-2-methoxybenzene sulphonamide peak in inject-tions of analytical standard solution.

$W_{Samp.}$ = Weight of the sample taken to prepare relevant sample solution (in mg)

$W_{Std.}$ = Weight of 5-(2R)-2-Aminopropyl)-2-methoxybenzene sulphonamide reference standard taken to prepare analytical standard solution (in mg)

P= Potency of 5-(2R)-2-Aminopropyl)-2-methoxybenzene sulphonamide reference standard (on dried basis)

Reference solution B is tested for recovery and reproducibility study and results are as follows:

Recovery

The table 1 shows recovery is more than 98% as well impurity.

Reproducibility

The data in table 2 shows reproducibility is more than 99% for the product as impurity on analysis of 3 consecutive days in triplicate. Assay value of each run (for the product and impurity) is taken into consideration and SD and RSD is calculated.

Table 2: Reproducibility

Run	Impurity	Tamsulosin HCl
1	2746178.00	24348461
2	2752958.50	24454437.00
3	2758496.00	24560259.50
4	2739105.00	24351020.00
5	2720213.00	24484170.00
6	2744250.00	24476808.50
7	2721655.00	24407703.00
8	2722091.00	24396490.50
9	2744311.00	24472651.50
Average	2738806.39	24439111
SD	13423.094	65207.99
RSD	0.49	0.27
Limit	Max. 10%	

RESULTS AND DISCUSSSION

As per USP XXVII, system suitability was carried out with freshly prepared reference solution B to check various parameters such as efficiency, resolution and peak tailing which found to comply with BP requirements.

Limit of detection- and limit of quantitation

The limit of detection (LOD) and Limit of Quantitation (LOQ) for the impurity was found to be 0.121ppm.

The optimum mobile phase of Acetonitrile and Potassium Dihydrogen Orthophosphate as mobile phase was selected as it was able to resolve peak of impurity from Tamsulosin Hydrochloride. Wavelength was selected by scanning standard drug over the wide range of wavelengths ranging from 200 nm to 400 nm. The analysis was performed at 275nm detector setting.

The content of an impurity in Tamsulosin Hydrochloride by proposed method revealed the lower values of reproducibility which indicates that the method is precise and accurate. The mean recoveries of Impurity were in the range of 99.3% to 100%, which shows that there is no interference from the mobile phase, which justifies the reproducibility and reliability of the given method.

CONCLUSION

The proposed method is simple, rapid and selective. Percentage relative standard deviation was very low, below 2.0%, which indicates that method is highly precise and accurate. Short Analysis time (≤10 min.) coupled with simplicity and ease of operation warrants the use of the said method for analysis of Tamsulosin Hydrochloride along with its impurity as stated above in Bulk drug also. Therefore, this method can be conveniently used in routine quality Control analysis in bulk drugs.

ACKNOWLEDGEMENT

Authors are thankful to the Management of Aarti Drugs Ltd. for providing the standard of Tamsulosin Hydrochloride and 5-(2R)-2-Aminopropyl)-2-methoxybenzene sulphonamide along with its certificate of analysis.

Table 3: System suitability parameter

Compound	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	MEAN	SD	RSD	T.P.	R.F.	T.F.
Tamsulosin HCl	24043360	24112985	24063107	24188160	24101903	24101903	55891.6211	0.2318971	3346.90	5.752	1.00
Retention Time	5.00	5.00	5.1	5.05	5.00	5.03	0.04	0.79	-	-	-
Impurity	2748640	2734322	2742995	2730302	2739065	2739064.8	7183.51833	0.26226171	1669.064	-	1.00
Retention Time	3.55	3.6	3.55	3.62	3.50	3.524	0.02244	0.6356	-	-	-

SD-Standard Deviation, RSD-Relative Standard Deviation, TP-Theoritical Plates, RF-Resolution Factor, TF-Tailing Factor.

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