WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 5.045
Volume 3, Issue 9, 998-1005. Research Article ISSN 2277– 7105

IMPURITY METHOD DEVELOPMENT AND VALIDATION OF TAMSULOSIN HYDROCHLORIDE BY USING RP-HPLC

M. Santhi Priya*[1], K.Shanta kumari[1], M. Bhanu Prasad[2], G.Priyanka[1], T.Sirisha[1]

[1] Department of Pharmaceutical Analysis, Nirmala College of Pharmacy, Atmakuru, Mangalagiri-522503, Guntur, India.

[2] Head, Quality Unit, Pellets Pharma pvt Ltd., Pashamylaram, Patancheru (M), Medak (dist), AP-502307.

Article Received on
04 September 2014,

Revised on 29 Sept 2014,
Accepted on 23 Oct 2014

***Correspondence for Author**
Dr. M. Santhi Priya
Department of Pharmaceutical Analysis, Nirmala College of Pharmacy, Atmakuru, Mangalagiri Guntur, India.

ABSTRACT

A simple, precise, rapid, specific and accurate reverse phase high performance liquid chromatographic method was developed for the estimation of Tamsulosin HCl and its related substances (impurity H and impurity I) in Tamsulosin HCl sustained release pellets. Chromatographic separation was performed on kromasil C-18 (250mmx4.6mm, 5µm) column, with mobile phase comprising of a mixture of buffer and acetonitrile (pH2.0, adjusted with conc.NaOH) in the ratio of 65:35v/v, at a flow rate of 1ml/min. The detection was carried out at 225 nm. The retention times of tamsulosin, impurity H and impurity I, were found to be 7.269, 24.902, and 48.239min respectively with a run time of 60min. As per ICH guidelines the method was validated for linearity, accuracy, precision, specificity, limit of detection and limit of quantitation, robustness and ruggedness. Linearity of tamsulosin HCl, impurity H and impurity I were found in the range of 0.0192-0.0512, 0.02-0.12 & 0.0192-0.0512µg/mL and correlation coefficient were 0.9998, 0.9993, and 0.9995 respectively. The results clearly demonstrated that the developed method was simple, precise, rapid, selective, accurate and reproducible for the estimation of impurity H and impurity I in tamsulosin HCl.

KEYWORDS: RP-HPLC. Tamsulosin HCl, Impurities, Validation.

INTRODUCTION

Drug profile: Tamsulosin HCL is described chemically as (R) - 5- (2- (2-ethoxyphenoxy)

ethy l aminopropyl)-2 methoxy benzene sulphonamide. It is a selective α1 receptor antagonist.

Impurity Profile: The present study was planned to estimate related substances in the pellets by developing and validating RP-HPLC method. In this paper, we describe a simple and rapid HPLC method for determination of synthetic impurities of TAM in SR Pellets by using a reverse phase C18 column with mobile phase comprising of a mixture of buffer and acetonitrile (pH2.0, adjusted with conc.NaOH) in the ratio of 65:35v/v, at a flow rate of 1ml/min. The detection was carried out at 225 nm.

MATERIAL AND METHODS

Materials and Reagents: All reagents were of analytical grade, HPLC grade acetonitrile, perchloric acid obtained from Merck specialities, India were used.High purity Milli-Q water purification system TAM and its impurities were purchased from cadila Health care Ltd, India.

Instruments: The HPLC system (Shimadzu LC-2010 CHT) used consists of a pump, auto sampler and U.V detector. The output signal was monitored and processed using LC-solutions software.

Chromatographic conditions: The mobile phase contains buffer pH 2.0 acetonitrile: water 65: 35%v/v. Before delivering into the system it was filtered through 0.45µm PTFE filter and degassed using a vacuum. The analysis was carried out under gradient condition using a flow rate of 1ml/min at 40ºC temperature. Chromatogram was recorded at 225nm using U.V. detector.

Method Development and Optimization: Solvent selectivity (solvent type), solvent strength, (volume fraction of organic solvent (s) in the mobile phase), detection wavelength and flow rate were varied to determine the chromatographic conditions giving the best estimation. The mobile phase conditions were optimized, so there was no interference with the Tamsulosin Hcl peak from excipient peaks. UV visible spectra in the range 200-400 nm were acquired from a solution of the drug in the mobile phase.

Chromatography: Sharp peaks were obtained for Tamsulosin Hydrochloride and its impurities. Typical chromatograms obtained from a solution of the drug are illustrated in figure1-3. The retention time of Tamsulosin Hcl and its impurities (impurityH&impurityI)

Were 7.269, 24.902, and 48.239min and the overall chromatographic condition is 60 min.

Method Validation: The proposed method was validated as per ICH guidelines

Analytical Procedure

Preparation of Standard Solution

Dissolved an accurately weighed quantity of 10mg of tamsulosinHCl working standard (In-House) and transfer carefully into a 100ml volumetric flask. Add few ml of mobile phase and sonicated for 5min. adjust the volume to the mark with mobile phase filter through whatmann filter paper. Dilute 2ml of the filtrate to 10ml with mobile phase. The concentration of the resulting solution was 20.0µg/ml.

Preparation of Impurity Standard H Solution

Dissolved an accurately weighed quantity of 3.5mg of impurity standard H directly into a10ml volumetric flask and adjust to the mark with mobile phase.

Preparation of Impurity Standard I Solution

Dissolved an accurately weighed quantity of 3.6mg of impurity standard I directly into a10ml volumetric flask and adjust to the mark with mobile phase.

Table 1 Optimized chromatographic condition.

S. No.	Parameter	Result
1.	Mobile phase	Buffer: ACN
2.	Ratio	65:35
3.	Detector	UV
4.	Detection wavelength	225nm
5.	Column (stationary phase)	C18 ,150X4.6mm id, 5µm
6.	Flow rate	1.0ml/min
7.	Column temp.	40^{o}C
8.	Volume of injection (µL)	20
9.	Run time	60min

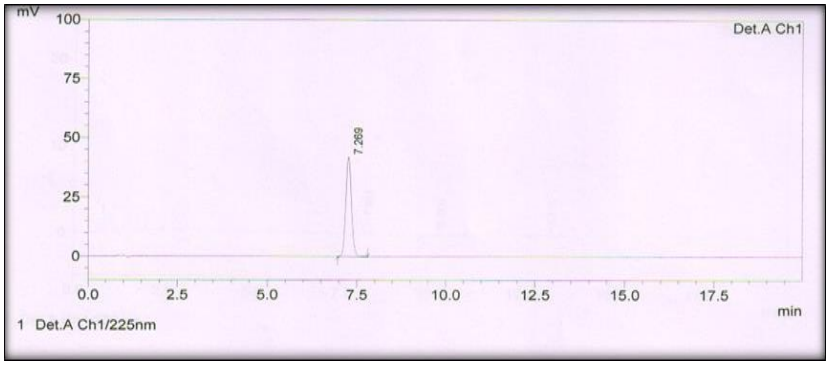

Fig.1. Optimized chromatogram of TAM Std

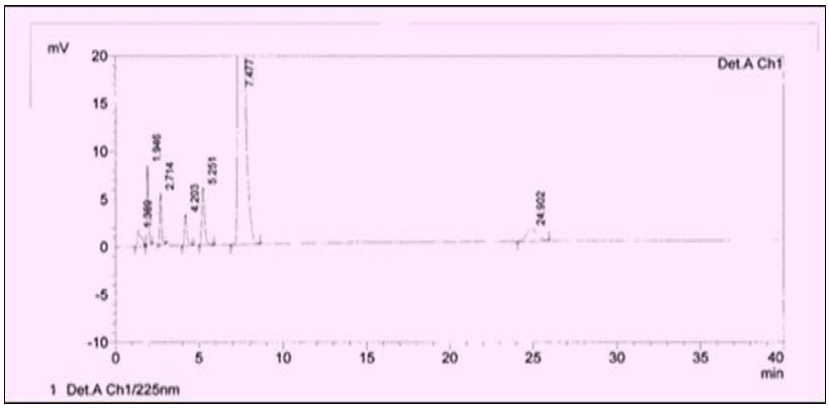

Fig.2.Optimized chromatogram of impurityH

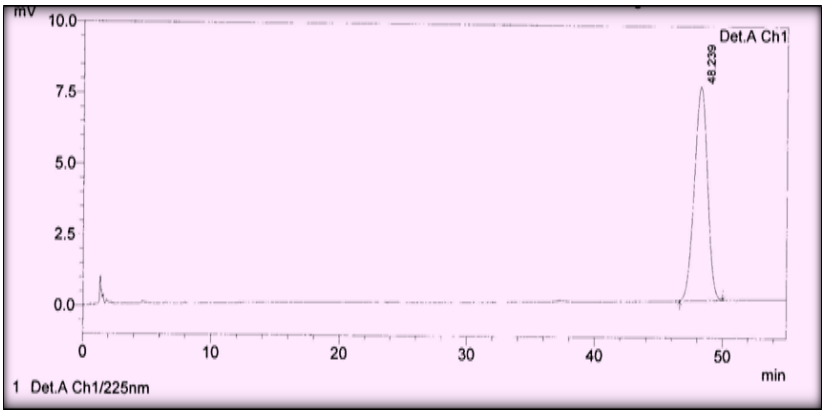

Fig.3.Optimized chromatogram of impurity I

Table.2. Optimized RRTS for impurities.

Impurity standard	RT(min)	RRT
H	24.902	3.42
I	48.239	6.63

Linearity

Calibration graph (concentration versus peak area) were constructed at different concentration for TAM (0.019- 0.051µg/ml),impurity H(0.0203-0.1218µg/ml) impurity I(0.0195-0.0525) Three independent determinations were carried out of each concentration and good linearity was found Table 3-4 gives linear equation, range and correlation coefficient for all compounds.

Table. 3. Linear regression data for TAM and its impurities

Compound	Con(µg/ml)	Linearregression	Correlationcoefficient
	0.019-0.015	90.851x - 479.76	0.9994
Impurity H	0.0203-0.121	50.473x + 57.398	0.9996
Impurity I	0.0195-0.0525	46.041x + 141.57	0.9996

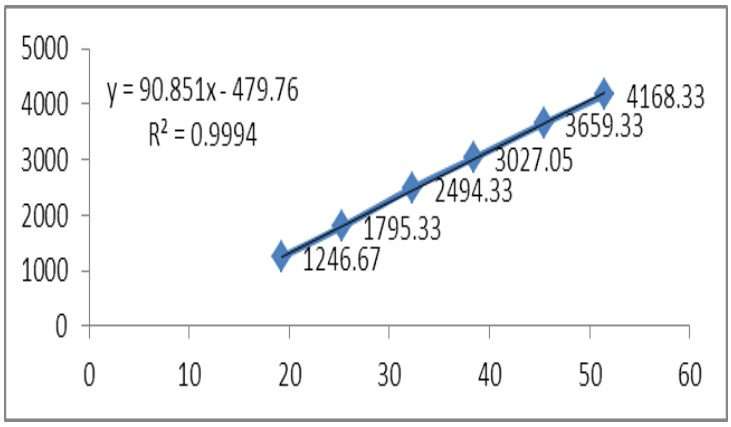

Fig.4.STD linearity Plo

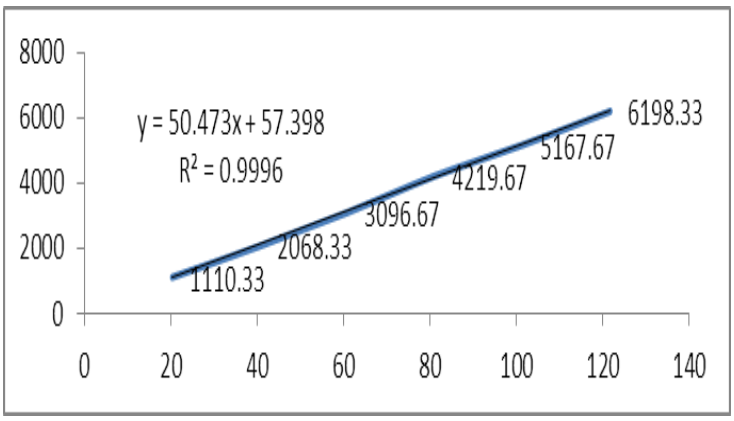

Fig.5.Impurity H linearity Plot

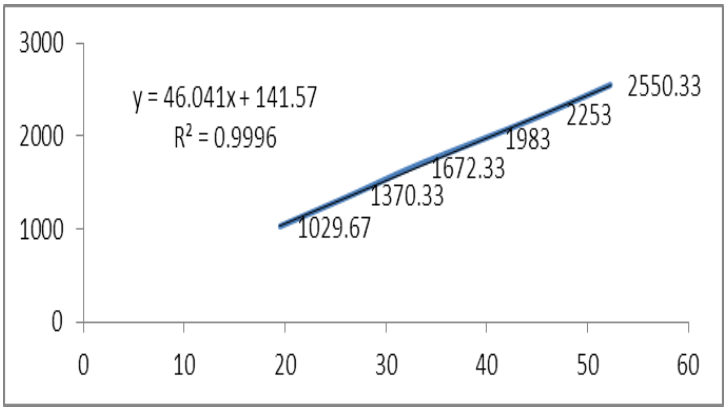

Fig.5.ImpurityIlinearityPlot

Accuracy: Standard mixtures containing known amounts of TAM, impurity H&I were prepared and analyzed by HPLC. The accuracy of the method was checked for three different concentration levels by standard addition technique. Small quantities of impurities (25%, 50%, 75%,100% & 125%, 150%) were added to the sample and spiked. It was found that three additions were accurately reflected in their peak areas. All estimation was repeated and standard deviations were calculated. The results were shown in Table

Recovery study for impurity H.

S. No	25%		50%		75%	
	AREA	%RECOVERY	AREA	%RECOVERY	AREA	%RECOVERY
1	1124	107.53	2022	96.72	3064	97.70
2	1079	103.22	2059	98.48	3157	100.67
3	1128	107.91	2124	101.59	3069	97.86
AVG	1110.33	106.22	2068.33	98.93	3096.67	98.75
SD	27.21		51.64		52.31	
% RSD	2.45		2.50		1.69	
S.No	100%		125%		150%	
	AREA	%RECOVERY	AREA	%RECOVERY	AREA	%RECOVERY
1	4132	98.82	5149	98.51	6125	97.66
2	4289	102.57	5164	98.80	6275	100.05
3	4238	101.36	5217	99.81	6195	98.77
AVG	4219.67	100.92	5176.67	99.04	6198.33	98.82
SD	80.09		35.73		75.06	
% RSD	1.89		0.69		1.21	

Recovery study for impurity I

S. No	60%		80%		100%	
	AREA	%RECOVERY	AREA	%RECOVERY	AREA	%RECOVERY
1	1019	101.48	1338	97.32	1657	98.10
2	1002	99.79	1387	100.88	1684	99.70
3	1068	106.36	1386	100.81	1676	99.22
AVG	1029.6	102.54	1370.3	99.67	1672.3	99.01
SD	34.27		28.01		13.87	
% RSD	3.33		2.04		0.83	
S.No	120%		140%		160%	
	AREA	%RECOVERY	AREA	%RECOVERY	AREA	%RECOVERY
1	2029	98.51	2328	100.24	2453	92.86
2	1944	94.38	2311	99.51	2616	99.03
3	1976	95.93	2120	91.28	2582	97.74
AVG	1983	96.27	2253	97.01	2550.33	96.54
SD	42.93		115.49		85.99	
% RSD	2.16		5.13		3.37	

Precision: Precision is a method and concentration specific, which in practice can be varied and the result for precision is standard deviation is 1.620241 Impurity profiling: (Spike study) Impurity profiling is a description of the identified and unidentified impurities in API and can be confirmed by spike study which means theaccuracy is validated by analyzing a synthetic mixture of components, which contain known amount of drug substance.

CONCLUSION

In present thesis a new method has been developed for the estimation of tamsulosin and its related impurities by RP-HPLC method since it is a versatile tool for the qualitative and

quantitative analysis of drugs and pharmaceuticals. The method was validated and found to be simple, sensitive, accurate and precise. It was proved to be convenient and effective method for development and validation.

ACKNOWLEDGMENT

The authors are thankful to Nirmala College of Pharmacy, Atmakuru, Mangalagiri Guntur, IndiaPellets Pharma pvt Ltd., Pashamylaram, Patancheru (M), Medak (dist), Hyderabad for providing the necessary facilities to carry out the research work.

REFERENCES

1. Mandava V. Basavasewara Rao, Bhumireddy Chennakesava Reddy, Tumati Srinivas Rao and Jamini Ranjan Mohanty, "Determination of Tamsulosine Hydrochloride 0.2% andTolterodine Tartrate 0.2% Combination Pellets By RP HPLC Method", Research Journal of Pharmaceutical, Biological and Chemical Sciences, 2010; 1(1):136-140.
2. Siva Rama Krishna G.V, Janardhan M and Rasool SK, "Development and Validation of Stability-Indicating RPHPLC Method for Estimation of Tamsulosin HCl Pellets", International Journal of Pharmaceutical Invention, 2012; 2(7): 51-60.
3. Thomas sudha and Jitendra dhomane, "A Validated RPHPLC Method For The Determination Of Impurities In Tamsulosin HCl" ,International Journal of Chemistry Research, 2011; 2(4):29-33
4. S. Vijaya saradhi, SK. Meherjaha, Y. Prithvi Prasad, P. Baby sirisha and C. Bala sekaran, "RP-HPLC Method For The Estimation of Tamsulosin In Bulk and Capsules", International Journal of Pharmacy and Pharmaceutical Sciences,2013; 5(2):342-345.
5. Nanda RK, Gaikwad J and Prakash A, "Estimation of Tamsulosin and Tolterodine in Its Pharmaceutical Dosage Form by Spectrophotometric Method" International Journal of Pharmtech Research, 2009; 1(3): 420-423
6. S. B. Bari, A. R. Bakhshi, P. S. Jain, and S. J. Surana Development and Validation of Stability-Indicating HPTLC Determination of Tamsulosin in Bulk and Pharmaceutical Dosage Form Chromatography Research International 20 December 2010.
7. D.B.PATEL*, N.J. PATEL Validated stability indicating HPTLC method for the determination of Tamsulosin hydrochloride in pharmaceutical dosage forms International Journal of Chem Tech Research Jan-Mar. 2010; 2(1): 646-652.
8. Chandorkar JG et al, Chandorkar J[1], Kotwal V, Dhande N, Gurav S, Pande V, Yadav P. A sensitive HPLC method for simultaneous estimation of tamsulosin hydrochloride and

its impurity. Pub med, 2008; 21(3):307-10.

9. Pritam S. Jain*, Amar J. Chaudhari, Pankaj R. Bari and S. J. Surana Validated stability-indicating RP-HPLC method for tamsulosine hydrochloride in pharmaceutical dosage form according to ICH guidelines, Application to stability studies Scholars Research Library, 2012; 4(6):1760-1767.