A validated simple titrimetric method for the quantitative determination of piroxicam from pharmaceutical dosages

R.V.Rele*, S.A.Sawant

Department of chemistry, D.G.Duparel College, Mahim, Mumbai-400016, (INDIA)
E mail : searchnil_2007@yahoo.com
Received: 26th May, 2009 ; Accepted: 31st May, 2009

ABSTRACT

A simple precise, rapid accurate and sensitive titration method was developed for quantitative determination of piroxicam in pharmaceutical dosage form. The titration was carried out using standardized 0.01 N sodium hydroxide. The proposed method was found to be precise with % RSD <1 (n = 6). The method showed strict linearity ($r^2 > 0.99$) between 20 % to 100 % of 100 mg of drug substance weight. The percentage recovery of piroxicam in the optimized method was between 99.55 % to 102.87 %. The method is also found to be rugged when checked by different analysts and using different lots of reagents and different laboratories.

© 2009 Trade Science Inc. - INDIA

INTRODUCTION

Piroxicam is 4 hydoxy-2-methyl-N (2-pyridyl) 2 H-1,2-benzothiazine-3-carbaxamide-1,1-dioxide, is a potent anti-inflammatory agent and differs radically in chemical structure from all commonly used non-steroidal anti- inflammatory drugs (NSAID). It is acidic, highly potent. It is used in variety of anti-inflammatory conditions such as rheumatoid arthritis, Osteo-arthritis and gout. Piroxicam has relative low toxicity and longer elimination half life in man compared to other NSAID.

Quantitative determination of the drug is very important in pharmaceutical control and assurance. The drug is been officially reported in IP[1] and USP[2] described the assay by high performance liquid chromatographic method. In BP[3] the assay of related substances of piroxicam capsules were described by thin layer chromatography method.

The literature survey revealed HPTLC[4], GLC[5], HPLC[6-8], Spectrophotometric[9-20] and polarogra-phy[21-24] methods for determination of piroxicam.

In the proposed methods, an attempt has been made to develop simple and suitable spectrophotometric methods for quantitative determination of Piroxicam. The developed spectrophotometric methods were successfully validated.

MATERIAL AND METHODS

Instrumentation

A Sartorious analytical balance with 0.01 mg was used.

Reagents and chemical

Sodium hydroxide, succinic acid and 1,4 dioxane of A. R. grade were used.

General procedure

Standardization of 0. 01 N sodium hydroxide

400 mg. of sodium hydroxide was transferred in

Full Paper

500 ml of beaker and dissolved in 250 ml of distilled water. It was transferred into 1000 ml of standard volumetric flask and diluted to 1000 ml with distilled water to give concentration as 0.01 N. This solution is standardized by using 0.01 N succinic acid. (0.01 N succinic acid was prepared by dissolving 0.1475g. of succinic acid in 250 ml of distilled water). It was titrated with 0.01 N perchloric acid until colour of phenolphthalein changes from colourless to pink.

TABLE 1: Validation

Weight of of piroxicam in mg.	Burette reading in ml.	Normality of sodium hydroxide	% Assay	Standard deviation	% RSD
10	3.1	0.01	102.87		
10	3.0	0.01	99.55		
10	3.0	0.01	99.55	1.7144	1.6847
10	3.1	0.01	102.87		
10	3.1	0.01	102.87		
10	3.1	0.01	102.87		

TABLE 2: Linearity

Level	Weight of piroxicam in mg	Burette Reading in ml.	Normality of sodium hydroxide	% Assay	Mean of % assay	Standard deviation	% RSD
1	20	6.1	0.01	101.21			
2	40	12.1	0.01	100.38			
3	60	18.1	0.01	100.108	100.46	0.1237	0.5005
4	80	24.2	0.01	100.384			
5	100	30.2	0.01	100.218			

The titration was performed in duplicate.

Normality of sodium hydroxide = $N_1 \times V_1 / V_2$

Where N_1 is Normality of standard succinic acid, V_1 is volume of succinic acid, V_2 is burette reading (Volume of sodium hydroxide required for titration).

Quantitative determination of piroxicam

About 10 mg. of piroxicam test sample was weighed accurately into a clean and dried titration jar. It was dissolved in 10 ml. of 1, 4 dioxane. It was titrated with standard solution of 0.01 N sodium hydroxide by using phenolphthalein as indicator till colour changes from colourless to light pink.

Blank determination was carried out for necessary correction.

One ml of 0.01 N sodium hydroxide is equivalent to 3.3185 mg. of piroxicam ($C_{15}H_{13}N_3O_4S$). The percentage of piroxicam was calculated as below:

% assay = B.R. × N × 3.3185 Y 100/ 0.01 × w

Where B.R. is burette reading in ml at the end point of titration, N is actual normality of sodium hydroxide, w is weight of the sample taken in mg.

RESULT AND DISCUSSION

Determination of rupatadine

The objective of this work was to determine accurately the content of piroxicam. The assay of piroxicam of various batches of piroxicam test sample was analyzed using the above method. It was in the range of

TABLE 3: Regression values

Correlation coefficient (r^2)	: 0.9999
Slope (m)	: 0.3000
Intercept (c)	: 0.1000
Regression equation	: Y = 0.3000X + 0.1000

99.45 % to 101.604 %.

Analytical method validation

The method precision was checked after analyzing six different preparations of homogeneous test sample of piroxicam. The % RSD of results obtained was found to be 0.5005. It confirms good precision of the method. The results are presented in TABLE 1.

Linearity

For the establishment of method linearity, five different weights of piroxicam test samples corresponding to 20 %, 40 %, 60 %, 80 % and 100 % of the about weight (0.1 g.) Were taken and analyzed for percentage(%) of piroxicam content. The results are in TABLE 2. The titration was conducted once at each level. Calibration curve was drawn by plotting test sample weight in gram on x axis and titre values on y axis.

The values of correlation coefficient, slope and intercept are given in TABLE 3.

Accuracy and recovery

Accuracy was determined at five different levels i.e., 20 %, 40 %, 60 %, 80 % and 100 % of the nominal concentration. (100 mg.) The titration was conducted in triplicate at each level and the titre value was re-

The titrimetric reaction is given as
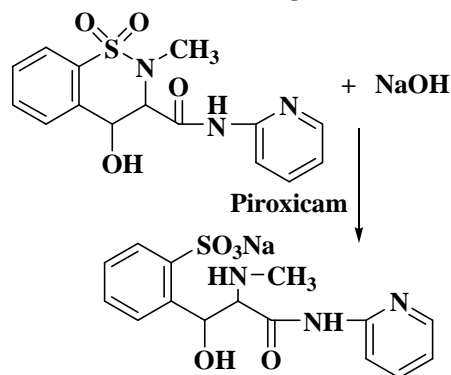
SCHEME 1

TABLE 4 : Accuracy and recovery

Level	Weight of piroxicam added in mg.	Weight of piroxicam found in mg.	% Assay	Mean of % assay
1	10	10.162	101.62	
	10	10.000	100.00	101.604
	10	10.320	103.20	
2	20	20.000	100.00	
	20	20.320	101.60	100.26
	20	19.836	99.18	
3	30	30.000	100.00	
	30	29.670	98.90	99.45
	30	29.835	99.450	
4	40	40.000	100.00	
	40	39.834	99.586	99.598
	40	39.660	99.150	
5	50	50.000	100.00	
	50	49.834	99.668	99.662
	50	49.66	99.320	

corded. The tire value obtained in linearity study was considered as true value during the calculation of percentage (%) recovery. The percentage recovery is calculated using following equation.

Percentage recovery = Titre value× 100/ True titre value

The percentage range recovery of piroxicam was in 99. 45 to 101.604 %. It confirms the accuracy of the proposed method. (TABLE 4).

Ruggedness

The ruggedness of the method is defined as degree of reproducibility of results obtained by analysis of piroxicam sample under variety of normal test conditions such as different laboratories, different analysts and different lots of reagents. Quantitative determination of piroxicam was conducted on one laboratory. It was again tested in another laboratory. The assays ob-

tained in two different laboratories were well in agreement. It proved ruggedness of the proposed method.

CONCLUSION

The proposed method of simple titrimetric method was found to be precise, accurate and rugged. The values of percentage recovery and standard deviation showed good sensitivity. The method was completely validated. It showed satisfactory data for all the parameters of validation. This is most simple method as compared all other methods reported in literature for assay of Piroxicam. It requires simple apparatus and less costly chemicals. From validation data it is observed that method is as sensitive as other methods were reported in literature hence it can be used in any analytical laboratory for assay of piroxicam form its pharmaceutical dosage such as capsules. Hence it can be applied for routine quality control application.

ACKNOWLEDGMENTS

REFERENCES

[1] Indian Pharmacopoeia, Controller of publication Delhi, **1-3**, **(2007)**.

[2] United State Pharmacopoeia, US Pharmaceutical convention inc. Rockville, Washington DC,USP 31 NF 26, **1-3**, **(2008)**.

[3] British Pharmacopoeia, Her Majesty's stationary office, London, **1-3**, **(2008)**.

[4] M.G.Qualglia, F.Capitani, M.Grande; Pharm.Acta Helv., **64(3)**, 86-89 **(1989)**.

[5] F.Capitani, F.Nocilli, G.C.Porretta, Farmaco; Ed.Prat., **43(5)**,189-199 **(1988)**.

[6] Y.H.Toai, Y.B.Huang; Indian Pharma., **15(9)**, 1441-1453 **(1989)**.

[7] H.Chen, Z.Y.Mi, W.Z.Liu; Fenxi Kexue Xuebao, **16(6)**, 470-473.

[8] L.Cao, S.R.Jang, R.Wan; Yaowu Fenxi Zazhi, **21(1)**, 47-48 **(2001)**.

[9] X.Hu, X.Zhou; Ultra-violet Spectrophotometric Determination of Piroxicam, Yaowu Fenxi Zazhi,

Full Paper

6(1), 30-31 **(1986)**.

[10] Z.Yu; Yaoxue Tongbao, **22(3)**,136-137 **(1987)**.

[11] C.S.P.Sastry, A.R.M.Rao, T.N.V.Prasad; Indian J.Pharm.Sci., **49(5)**, 199-200 **(1987)**.

[12] N.Bergisacli; Acta Pharma, **30(4)**, 145-148 **(1988)**.

[13] D.M.Shingbal, S.Sarjyotishi; Indian Drugs, **25(12)**, 531-532 **(1988)**.

[14] K.P.R.Chowdary, A.S.R.Murthy; Indian Drugs, **26(2)**, 89-90 **(1988)**.

[15] A.S.Dhake, N.N.Singh, A.Y.Nimbkar, H.P.Tipnis; Indian Drugs, **26(4)**, 190-191 **(1989)**.

[16] J.Emmanuel, S.D.Haldankar; Indian drugs, **26(6)**, 320-322 **(1989)**.

[17] J.Emmanuel, U.S.Quenim; East. Pharm., **33(385)**, 185-186 **(1990)**.

[18] G.R.Rao, S.S.N.Murty, I.R.K.Raju, P.J.Rao; J.Inst. Chem., **62(1)**, 19-21 **(1990)**.

[19] B.E.Rao, S.Raghuveer, C.M.R.Srivasatav, D.K. Vasta; Indian Drugs, **30(4)**, 194-197 **(1993)**.

[20] El Ries; Anal.Lett., **31(5)**, 793-807 **(1998)**.

[21] L.P.Haung, G.R.Chen, Zhonggu Yiyao Gongly; Zazhi, **23(3)**, 122-123 **(1992)**.

[22] M.Ganzalex, M.D.Vazquez, M.L.Jascon, Sanchez Batanero; Electroanalysis, **6(5-6)**, 497-504 **(1994)**.

[23] N.Charalampopoulos, K.Avgoustakis, C.G. Konloyannis; Anal.Chem.Acta, **491(1)**, 57-62 **(2003)**.

[24] H.L.Ma, M.I.Xu, J.F.Song; Fenni Shiyanshi, **24(2)**, 51-54 **(2005)**.