SHORT COMMUNICATION

METHOD DEVELOPMENT AND VALIDATION OF FLURBIPROFEN SODIUM BY USING UPLC

ABSTRACT

A simple, precise, and accurate ultra-performance liquid chromatography was developed for flurbiprofen sodium on Acquity BEHC18, (50 x 2.1 mm, 1.7 µm) using acetonitrile: water: glacial acetic acid as the mobile phase. The flow rate was 0.2 mL min^{-1} and effluent was monitored at 254 nm. The retention time for flurbiprofen sodium was found to be 2.3. Developed method was validated for precision, accuracy, linearity range, robustness and ruggedness as per ICH guideline.

Keywords: Flurbiprofen Sodium, Ultra Performance Liquid Chromatography, ICH guidelines

INTRODUCTION

Flurbiprofen is a propionic acid derivative that may have a more intricate mechanism of action than other types of nonsteroidal anti-inflammatory drugs (NSAIDs). Its (S) (-) enantiomer inhibits COX non-selectively, but it has also been shown in rat tissue to affect TNF- α and nitrous oxide synthesis[1].

Literature survey revealed LC[2], UV spectrophotometry-LC[3], LC-MS[4-6], GC-MS[7,8], HPLC[9- 12], HPTLC[13], capillary zone electrophoresis and spectrofluorometric method[14] had been reported for the estimation flurbiprofen sodium alone or in combination with other drugs. The analytical method for flurbiprofen sodium active pharmaceutical ingredient has not been reported. The present paper describes a simple, specific, accurate, and precise Ultra Performance Liquid Chromatography for flurbiprofen sodium.

MATERIALS AND METHODS

The UPLC system used for method development and validation was the Waters 2695 separation module consisting of a binary pump plus auto sampler and 2996 photodiode array [PDA] detector. The output signal was monitored and processed using Empower software. Acquity BEHC18 (50 x 2.1 mm, 1.7 µm) column was used. Acetonitrile of HPLC grade [Merck], double distilled water, glacial acetic acid was used as mobile phase in the ratio 50:49:1(V/V/V).

The mobile phase containing acetonitrile: water: glacial acetic acid (50:49:1) was prepared, filtered and degassed. Finally, the solution was filtered through 0.22 µm filter paper. The flow rate was set as 0.2 mL min^{-1}. Flurbiprofen sodium drug shows good absorbance at 254 nm, which was selected as the wavelength for further analysis. All determinations were performed at ambient column temperature.

Calibration curves were prepared by taking appropriate flurbiprofen sodium stock solution in different volumetric flasks of 10 mL and diluted up to the mark with mobile phase to obtain final concentrations of 25, 40, 50, 60, 70 and 75 µg mL^{-1} of flurbiprofen sodium. These solutions (n = 6) were injected, and chromatograms were taken. The flow rate was maintained at 0.2 mL min^{-1}, the temperature of the column was kept ambient, and the column effluents were monitored at 254 nm. A calibration curve was constructed by plotting peak area v/s concentration, and a regression equation was computed. R^2 values of flurbiprofen sodium were found to be 0.999.

The developed method was validated in terms of linearity, specificity, precision, accuracy, robustness and ruggedness.

To develop a simple, specific, accurate, and precise Ultra Performance Liquid Chromatographic method for flurbiprofen sodium, different mobile phases were tried, and the proposed chromatographic conditions were found to be appropriate for the quantitative determination. System suitability tests were carried out as per ICH guidelines. A typical chromatogram of flurbiprofen sodium is shown in Fig. 1.

The developed UPLC method was validated as per International Conference on Harmonization guidelines[15].

The peak purity of flurbiprofen sodium was assessed by comparing the retention time of standard flurbiprofen sodium and the sample. A good correlation was obtained between the retention time of the standard and the sample. There are no interferences; hence the method is specific.

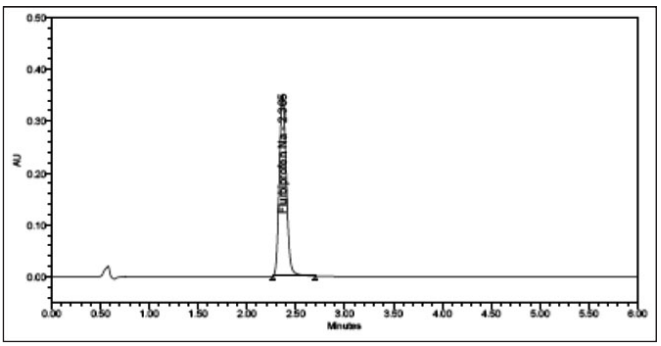

Fig. 1: Typical Chromatogram of flurbiprofen sodium

Linearity was studied by preparing standard solutions at different concentration levels. The linearity range for flurbiprofen sodium was found to be as 10-60 µg mL^{-1}. The regression equation for flurbiprofen sodium with a correlation coefficient (R^2) of 0.999 was found to be as follows,

$$y = 39218x - 86878$$

To evaluate the robustness of the developed UPLC method, small deliberate variations in optimized method parameters were done. The effect of changes in flow rate, pH, and column temperature on retention time and tailing factor were studied. The method was found to be unaffected by small changes like +/- 0.2 mL in flow rate and +/- 5 ˚C in column temperature.

Table I: Validation parameters

Parameter	Results			Specified limits
Linearity	0.999			0.999
Precision	% RSD - 0.17			% RSD < 2
Results of Accuracy				98-102 %
Concentration level	80 %	100 %	120 %	
Mean % recovery	100 %	100 %	100 %	

CONCLUSION

The developed method is simple, specific, accurate, and precise and hence can be used in routine analysis of flurbiprofen sodium. Statistical analysis of the results has been carried out that showed high accuracy and good precision. The % RSD for all parameters was found to be less than one, which indicates the effectiveness of the method and assay results obtained by this method are in fair agreement (Table I). The developed method can be used for routine quantitative analysis of flurbiprofen sodium.

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