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HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC DETERMINATION OF DICLOFENAC SODIUM FROM PHARMACEUTICAL PREPARATION

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ABSTRACT

A simple and rapid HPLC procedure is described for the assay of diclofenac sodium from pharmaceutical preparation. The assay was carried out on a stainless steel column of microbondapak CN (30 cm x 3.9 mm I.D.) at ambient temperature using methanol and acetate buffer solution of pH-3.7 in the ratio of 65:35 as the mobile phase, with UV detection at 280 nm. The elution was performed at the flow rate of 1 ml/min.

INTRODUCTION

Diclofenac sodium chemically [0-(2,6-dichloroanilino) phenyl] acetic acid sodium salt is a non steroidal drug possessing anti-inflammatory analgesic, and antipyretic activities. It has been indicated for the symptomatic treatment of rheumatoid arthritis and other rheumatic disorders. Methods are

reported in the literature for the determination of diclofenac sodium from blood plasma, urine and biological materials (1-12)

This report describes an HPLC procedure for the assay of diclofenac sodium from pharmaceutical preparation. This method is simple, accurate and rapid.

EXPERIMENTAL

Materials - The diclofenac sodium reference standard and tablets were provided by the manufacturers. All chemicals were either reagent or spectrophotometric grade and used without further purification. Membrane filters were used for filteration of the HPLC mobile phase and sample solutions.

High Performance Liquid Chromatography - 'Waters' high performanceliquid chromatograph (Model 440) with a solvent delivery system (Model M-45) equipped with U_6K universal injector and fixed wavelength UV detector (280 nm) was used. The instrument was equipped with a single pen recorder by 'Omniscribe' with an input of 10 mV. A stainless steel column (30 cm x 3.9 mm ID) of microbondapak CN was used. Methanol - acetate buffer solution of pH-3.7 (65:35 V/V) was used as the mobile phase and was filtered and deaerated prior to use. The flow rate was 1 ml/min at room temperature.

Standard Solution Preparation - 20 mg of Para-Nitrobenzoic acid, the internal standard, was dissolved in 100 ml of methanol. 20 mg of diclofenac sodium standard, accurately weighed, was transferred in to a 100 ml volumetric flask, methanol was added to volume and the solution was mixed.

Sample Preparation :- Twenty tablets were weighed, average weight of a tablet was calculated. The tablets were powdered in a glass mortar. Powder equivalent to the weight of 20 mg of diclofenac sodium was accurately

weighed and transferred into a 100 ml volumetric flask. It was dissolved in methanol and mixed.

Assay Procedure - All the HPLC operating conditions were set. Into a series of 10 ml volumetric flasks, varying amounts of standard drug solution (1 ml to 5 ml) were added. To each flask 1 ml of the internal standard was added. The solutions were diluted upto the mark with the methanol. Ten microlitre solution from each flask was injected in the system in duplicate. The peak heights of the standard and the intrnal standard were measured and their ratios were computed. A plot of peak height ratios against the amount of drug injected into the system was linear in the range of 0.02 mg/ml to 0.10 mg/ml (Figure-1)

Calculation

The quantity of diclofenac sodium per tablet was

$$\frac{Hs/Hx}{Rs/Rx} \times A \times \frac{D}{W} \times \text{Average Weight}$$

where,

Hs/Hx - Peak height ratio of the sample to the internal standard

Rs/Rx - Peak height ratio of the standard to the internal standard.

A - mg of diclofenac sodium per ml

D - Dilution factor

W - Weight of the powder taken for determination

To study the recovery and accuracy of the proposed method a method of standard addition was applied at three different levels. An intrnal standard

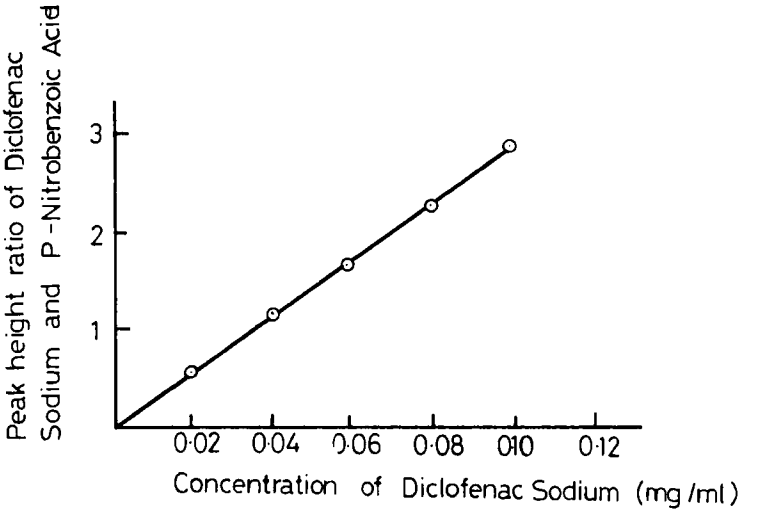

FIGURE - 1

Standard curve of concentrations of diclofenac sodium versus ratio of the peak heights of diclofenac sodium/P-Nitrobenzoic acid.

was added to each level. Each level was repeated seven times. The percentage recovery was calculated using the formula.

$$\% \text{ recovery} = \frac{N(\Sigma XY) - (\Sigma X)(\Sigma Y)}{N(\Sigma X^2) - (\Sigma X)^2}$$

where,

X = Amount of the standard diclofenac sodium added

Y = Amount of diclofenac sodium found by the proposed method

N = Number of observations.

The graph of diclofenac sodium found out by the proposed method against the amount of standard diclofenac sodium added is shown in figure-2.

Results and discussion

Diclofenac sodium is not described in any of the pharmacopoeias, as such there are no official methods for the determination of diclofenac sodium.

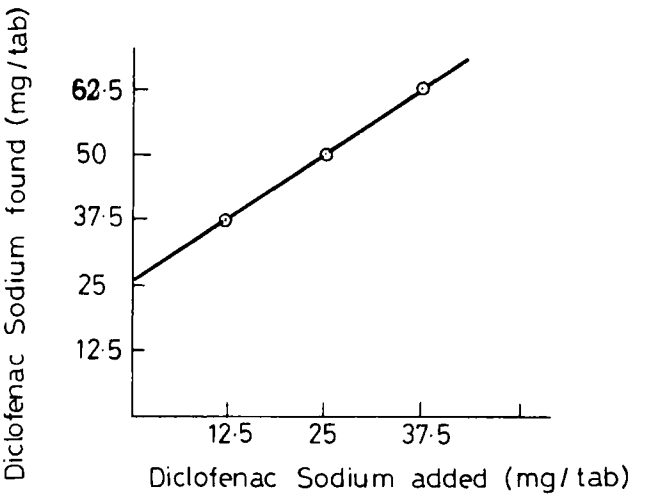

FIGURE - 2
Recovery experiment for diclofenac sodium

Also there is no method described in the literature for the determination of this drug from pharmaceutical preparation. Therefore, it was thought necessary to develop a simple, fast and accurate method for the determinationof diclofenac sodium for pharmaceutical preparations.

In this procedure the mobile phase was acidfied with acetate buffer to pH-3.7 to suppress the ionization of diclofenac sodium and reduce peak tailing. As shown in Figure 3 diclofenac sodium and the internal standard were well resolved. The retention times were aproximately 3.2 min and 3.7 min. for Para-Nitrobenzoic acid and diclofenac sodium respectively. The peak height ratio response was shown to be linear throughout the diclofenac sodium concentration range of 0.02 mg/ml to 0.10 mg/ml with a correlation coefficient of 0.999. No significant interference from inpurities was detected under the chromatographic conditions described.

The results of the analysis of diclofenac sodium tablets and recovery experiments are summarised in Table.

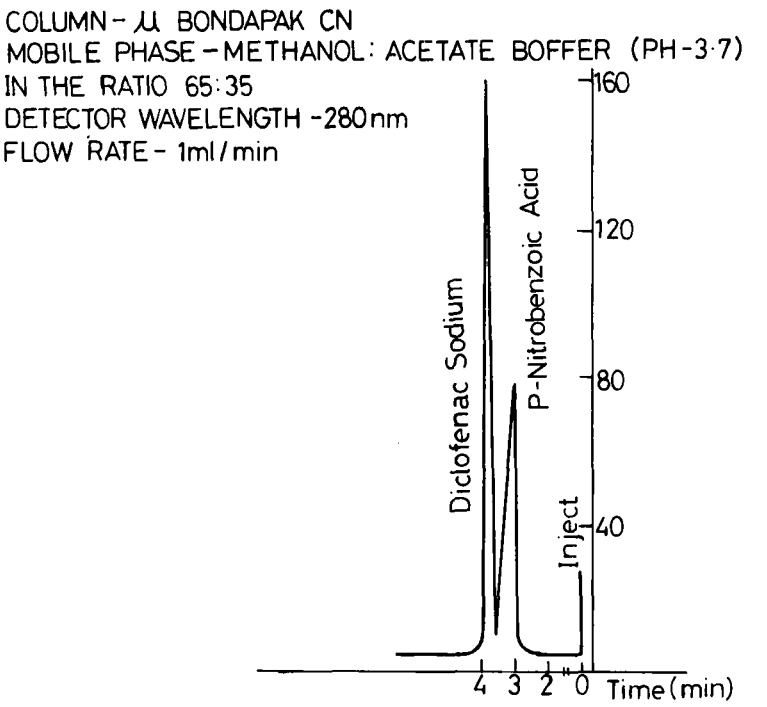

FIGURE - 3

A typical standard chromatogram

Table

HPLC determination of diclofenac sodium

Formulation : Tablet - 25 mg/tab.

Results of replicate analysis and values of statistical parameters

Amount labelled in 'mg'	Amount found in 'mg'	Percentage recovery	Standard deviation	Coefficient of variation (%)	Relative mean deviation (%)
25.0	25.35	98.52	0.237	0.614	0.498

The recovery value suggets that there is no interference from any excipients which are normally present in tablets. The standard deviation and coefficient of variation values are low indicating high precision and accuracy of the method. The peaks obtained are sharp, symmetrical and have clear base line separation. The complete elution is over within just 4 minutes. Hence the proposed HPLC method can be conveniently used for the routine determinationof diclofenac sodium in pharmaceutical preparation.

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