Spectrophotometric method for estimation of thiocolchicoside and diclofenac potassium in capsule dosage form by simultaneous equation method

Vilas. D. Patil[*] and R. Y. Chaudhari

Department of Chemistry, Jodhpur National University, Jodhpur, (Rajasthan), India.

Research Article

Abstract

A simple, rapid, accurate and precise spectrophotometric method has been developed for simultaneous estimation of Thiocolchicoside and Diclofenac Potassium from capsule dosage form. Proposed method involves formation of 'simultaneous equations' at 259 nm and 277 nm, using 0.1N NaOH as a solvent. The linearity was observed in the concentration range of 4 - 24 µg/ml for THC and 10 - 60 µg/ml for DICP. The results of analysis have been validated statistically and by recovery studies.

Key Words: Thiocolchicoside, Diclofenac Potassium, Spectrophotometry

Introduction

Thiocolchicoside (THC) is a muscle relaxant. (Thiocolchicoside), a muscle relaxant agent with anti-inflammatory and analgesic actions, also is used topically for the treatment of muscular spasms and for rheumatologic, orthopedic, and traumatologic disorders. Chemically it is N-[(7S)-3-(beta-D-glucopyranosyloxy)-1,2-dimethoxy-10-(methylsulfanyl)-9-oxo-5,6,7,9-tetrahydrobenzo[a]heptalen-7-yl]acetamide.

Diclofenac potassium (DICP) is a pain-relief medication that is commonly used to treat symptoms of osteoarthritis or rheumatoid arthritis, painful menstrual periods, and general pain. It works by inhibiting the action of certain hormones that cause inflammation and pain in the body. The medication is available in several strengths and comes in the form of a tablet, liquid-filled capsule, and powder. Chemically it is 2-[(2,6-dichlorophenyl) amino] benzeneacetic acid.

Literature survey revealed that visible spectrophotometric and HPLC[2,3] methods are available for estimation of THC in combination with drugs from pharmaceutical formulations, spectrophotometric, RP-HPLC[4,5], methods for estimation of DICP in combination with drugs from pharmaceutical formulations. So here an attempt has been made to develop simple, accurate, sensitive, rapid and economic method for simultaneous estimation of Thiocolchicoside and Diclofenac Potassium from Capsule dosage forms using UV – Visible spectroscopy.

*Corresponding Author
E. Mail: rajputvilas@yahoo.co.in

Material and Methods

Reagents and Chemicals

0.1 N NaOH solution was used as solvent which was prepared by dissolving 4 gm NaOH in 1000 ml of distilled water. Analytical pure standard sample of THC was supplied as gift sample by Ajanta Pharma pvt ltd, Mumbai and DICP was supplied from Plethico Pharmaceuticals, Indoreand used without further purification.

Instrumentation

The instrument used for the entire analysis was SIMADZU UV 1700 UV-VIS recording spectrophotometer. It is a double beam high speed scanning spectrophotometer with advanced quantitative software and provides full facilities for monochromators, a CRT display and a parallel head printer.

Preparation of standard stock solution

For the preparation of standard stock solution about 100 mg of Thiocolchioside (THC) and 100 mg of Diclofenac potassium (DICP) were accurately weighed and transferred to two separate 100 ml volumetric flasks. Each drug was dissolved in 40 ml of 0.1N NaoH and shaken gently for 10 min. The volume was made up to the mark with 0.1N NaoH to get stock solution of 1000 µg/ml.

Methods

Method: Simultaneous Equation Method[5]

In simultaneous equation method, when no region can be found free from overlapping spectra of two chromophores, it is still possible to device a method based on measurements at two wavelengths. Two dissimilar chromophores must necessary have different powers of light absorption at some point or in linear absorption spectra.

If samples contain two absorbing drugs (**X** and **Y**), each of which absorbs at the **λmax** of the other, it may be possible to determine both drugs by the technique of simultaneous equations.

From overlain spectra (Fig 1.) 259 nm λmax for THCand 277 nm λmax for DICP were selected for formation of simultaneous equation of two drugs. The absorbance at 259 nm and 277 nm for THC and DICP were measured. The absorptivity values of each drug at both wavelengths were determined. The absorbance and absorptivity at this wavelength were substituted in following equations to obtain the concentration of both drugs.

$$Cx = \frac{A2ay1 - A1ay2}{ax2ay1 - ax1\,ay2} \quad \mathbf{I}$$

$$Cy = \frac{A1ax2 - A2ax1}{ax2ay1 - ax1\,ay2} \quad \textbf{II}$$

Where, A1 and A2 were absorbance of sample at 259 nm and 277 nm respectively, ax1 and ax2 are absorptivity of THC at 259 nm and 277 nm, ay1 and ay2 are absorptivity of DICP at 259 nm and 277 nm.
Validity of above framed equation was checked by using mixed standard of pure drug sample of two drugs, measuring their absorbance at respective wavelength and calculating concentration of two components. Results of which are reported in Table.1.

Assay of pharmaceutical formulation
Twenty capsules were weighed ingredients of capsule were taken and empty shell were weighed again, weight of empty shell was subtracted from total weight and then average weight of ingredients was calculated. Ingredients were crushed to obtain a fine powder. An accurately weighed sample equivalent to 100 mg of THC and 100 mg of DICP was taken in a stoppered volumetric flask (100.0ml); 40ml of 0.1 N NaoH was added and sonicated for 10 min. The solution was filtered through Whatmann filter paper (No 41) and the volume was made up to the mark with the same solventThe aliquot portions of above solutions were further diluted with solvent to get final concentration of about 4 μg/ml THC and 25μg/ml of DICP, respectively and absorbances were measured at 259.0 nm and 277.0 nm against blank. The concentrations of two drugs in sample were determined by using equations1 and 2. The results are reported in the Table 2.

Recovery studies
The accuracy of the proposed method was checked by recovery studies, by addition of standard drug solution to pre analyzed sample solution at three different concentration levels (80%, 100%, and 120%) within range of linearity for both the drugs. Results are reported in table 3.
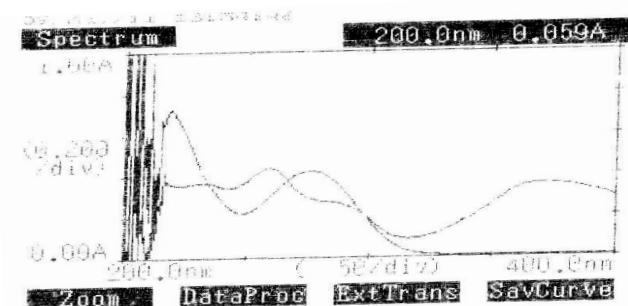

Results and discussion
Method: Simultaneous Equation Method
UV-spectrophotometric method using simultaneous equation was developed. THC showed absorbance maxima at 259 nm and DICP at 277.0 nm. Linearity was observed in the concentration rage of 4 - 24 μg/ml for THC and 10 -60 μg/ml for DICP correlation coefficient was found to be 0.9999 and 0.9999 at 259 nm and 277 nm respectively. The proposed method was applied for pharmaceutical formulation and % label claim for THC and DICP was found to be 99.81 and 103.5, respectively. The method is accurate and precise and can be used for routine pharmaceutical analysis.

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Fig. 1: Overlain spectra of THC and DICP

Table 1: Result of analysis of mixed standard

S/No.	Conc Taken µg/ml THC	DICP	Conc Found*µg/ml THC	DICP	Amount found(%) THC	DICP	SD THC	DICP	% RSD THC	DICP
1.	4	25	3.90	26.24	97.6	104.9	0.033	0.033	0.84	0.12
2.	8	20	8.24	20.3	102.5	101.96	0.022	0.029	0.26	0.14
3.	12	15	12.3	14.32	103.2	95.4	0.019	0.026	0.15	0.17

Table 2: Result of analysis of Capsule formulation

Sample	Label claimed THC	DICP	% Label estimated THC	DICP	± S.D THC	DICP	% R.S.D THC	DICP
1	4mg	25 mg	99.2	104.9	0.031	0.033	0.083	0.015

Table 3: Result of recovery studies of THC and DICP

S/No	Preanalyzed Sample Solution(µg/ml) THC	DICP	Pure Drug Sample Added(µg/ml) THC	DICP	% Recovery ± S.D THC	DICP
1	4	25	3.2	20.0	103.65±0.11	102.21±0.18
2	4	25	4.0	25.0	101.07±0.11	104.36±0.18
3	4	25	4.8	30.0	100.34±0.11	101.49±0.18