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QUANTITATIVE DETERMINATION OF DULOXETINE HYDROCHLORIDE IN PHARMACEUTICAL FORMULATION BY UV-SPECTROPHOTOMETRY AND FIRST ORDER DERIVATIVE METHODS

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ABSTRACT

Two methods, 'UV- Spectrophotometric' and 'First order derivative' methods have been developed for determination of Duloxetine HCl in bulk and in tablets. In Double Reverse osmosis (R.O.) water, Duloxetine HCl showed maximum absorbance at 289 nm and same spectrum was derivatised into first order derivative at Ä ë = 2; amplitude of the trough was recorded at 275 nm. In both proposed methods Duloxetine HCl follows linearity in the concentration range 10-60 mcg/ml for Simple UV Spectrophotometry & 5-30 mcg/ml for first order derivative spectroscopy. Assay results were in good agreement with the label claim. As the percentage relative standard deviations were found to be less than 2, both the methods proved to be precise and accurate.

Keywords: *Duloxetine HCl; UV-Spectrophotometry; First order derivative.*

INTRODUCTION

Duloxetine HCl (DLX) is chemically, (+)-*N*-methyl-3-(1-naphthalenyloxy)-3-(2-thienyl) propanamine hydrochloride, which has chemical formula $C_{18}H_{19}NOS.HCl$ and has Molecular weight 333.87[1]. Duloxetine hydrochloride is a newer selective serotonin and norepinephrine reuptake inhibitor (SSNRI) used for major depressive disorders[2, 3]. Duloxetine HCl is not official in any pharmacopoeia.

A very few analytical methods in literature were reported for the determination of DLX and its key intermediate, desmethyl duloxetine in human serum by HPLC method[4,5]. Literature reported the characterization of phenolic impurities in DLX samples by MS, NMR, X-ray-analysis[6] and impurities formed by interaction of DLX with various enteric polymers[7]. A validated UV spectrophotometric method for determination of DLX[8]. The objective of the present work was to develop analytical methods UV-Spectrophotometry 'Method 1' and first order derivative 'Method 2' for quantitative determination of DLX in bulk and in tablets. The methods were validated for accuracy, precision and ruggedness[9], while being simple, most economical due to use of solvent Double Reverse osmosis (R.O.) water and less time consuming and can suitably apply for the routine analysis of DLX in pharmaceutical formulations.

MATERIALS AND METHODS

Solvents

Double reverse osmosis (R.O.) water

Method-1 UV-Spectrophotometry

Standard stock solutions was prepared by dissolving 10 mg DLX in 100 ml of Double reverse osmosis (R.O.) water to get concentration of 100 mcg/ml. Appropriate serial dilutions were made in double R.O. water in the concentration range 10-60 mcg/ml. The solution were scanned on Spectrophotometer - 2450 (Shimadzu) in the UV range 200-400 nm. DLX showed absorbance maxima at 289 nm (Fig.1). The analytical curve was constructed by plotting concentration verses absorbance.

Method-2 First Order Derivative Method

From the stock solution, serial dilutions of concentration 5-30 mcg/ml were prepared and derivatised into first order derivative, using UV probe 2.21 software of instrument, where Ä ë = 2 (Fig.2). The amplitudes of corresponding troughs were measured at 275 nm and plotted against the concentrations.

Preparations of sample solutions

The contents of 20 tablets were accurately weighed, an amount of powder equivalent to 10 mg DLX was transferred in to 100 ml calibrated volumetric flask, extracted with 40 ml double R.O. water, shaken manually for 10 min., volume was adjusted to mark with same solvent and filtered through Whatmann filter paper no. 41. The resulting solution was diluted to obtain appropriate concentration, absorbance in 'Method 1' and amplitude in 'Method 2' were recorded at selected wavelengths. The amount of the drug was determined using linear regressions equations.

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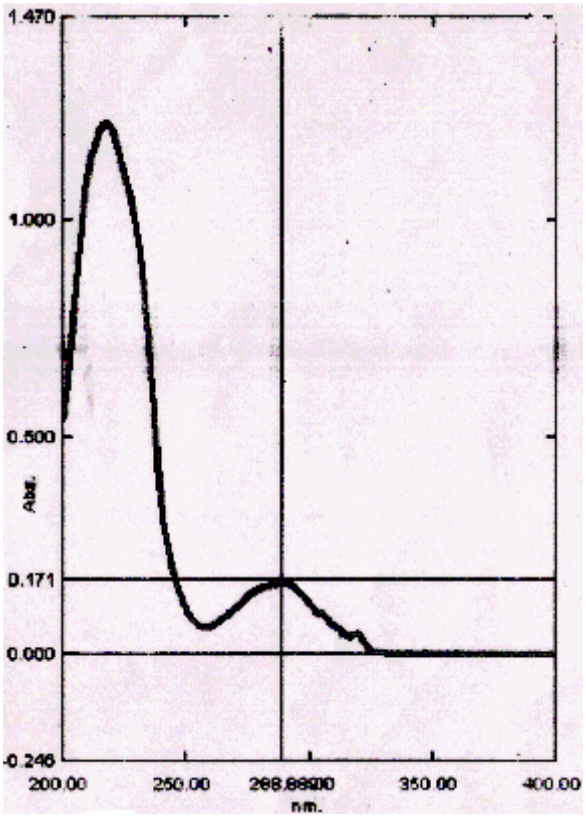

***Fig.1**: Simple UV spectrum of DLX in double R.O. Water*

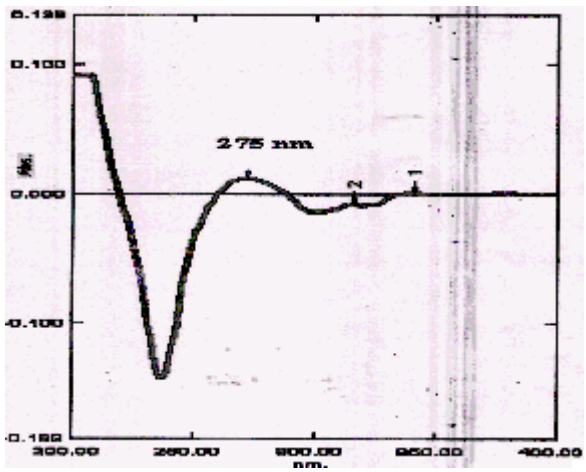

***Fig.2**: First- Order derivative spectrum of DLX in double R.O. Water*

RESULTS AND DISCUSSIONS

In double R.O. water, ë max of DLX was found to be 289 nm. The same spectrum was derivatised into 'First order derivative'. In method 1 and 2, DLX followed linearity in the concentration range 10-60 mcg/ml and 5-30 mcg/ml, respectively. The developed method was applied for pharmaceutical formulation. The % amount of DLX estimated from tablet formulation by method 1 and method 2 was found to be 99.61 (%RSD 0.52) and 98.84 (% RSD 1.64), respectively. The results from validation of the methods are shown in Table 1. Both these methods were proved to be accurate, precise, and rugged as indicated by low values of % RSD. The low values of LOD and LOQ indicates adequate sensitivity of the methods. Both the methods are simple, economical and can suitably apply for the routine analysis of DLX in pharmaceutical formulations.

***Table 1:** Summary of validation parameters*

Parameters	Method 1	Method 2
Linearity and range (mcg/ml)	10.00 - 60.00	5.00 - 30.00
LOD[mcg/ml]	0.714	1.752
LOQ [mcg/ml]	2.163	2.654
Accuracy[% Recovery; n=9]	100.64	100.30
%RSD	1.115	1.921
Precision [%RSD]		
Intra-day [n = 3]	0.328 -1.190	0.317 - 1.117
Inter-day [n = 3]	0.663 - 0.826	0.632 - 0.864
Repeatability [%RSD; n = 6)	0.368	1.638
Ruggedness [%RSD]		
Analyst I [% RSD; n=5]	0.372	1.694
Analyst II [% RSD; n=5]	1.153	1.704

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