

Use of Ultraviolet Spectroscopy for Determination of Xylometazoline Hydrochloride in Some of Its Pharmaceutical forms

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Abstract

This method is based on ultraviolet spectroscopy, determination of xylometazoline in some of its pharmaceutical forms is rapid, sensitive and uncomplicated; Using the second derivative pattern, through which the drug xylometazoline was quantitatively and accurately determined, the linearity reached (5-50 µg.ml⁻¹), The estimate was based on the peak height of the wavelength (220 nm) and the area under the beam at (214-224 nm). Through statistical operations, the results showed that the method is accurate and acceptable compatibility, as it was found that the Rec value is (98.75-105%) and the RSD value is (0.83-4.4%), the method was applied to a several pharmaceutical forms that available in the local market and it was successful.

Keywords: xylometazoline hydrochloride, spectrum of derivative and second derivative.

1. Introduction

Xylometazoline hydrochloride is systemically named according to the IUPAC system 2- [(4-tert. butyl-2,6-dimethyl phenyl) methyl]-4,5-dihydro-1H-imidazole hydrochloride.

Which has some important physical properties such as being easily soluble in water, methanol and ethanol, Xylometazoline is used to treat some respiratory diseases such as Nasal congestion and minor swellings due to allergies or Catch colds (1).

Figure 1 shows the chemical structure of the drug.

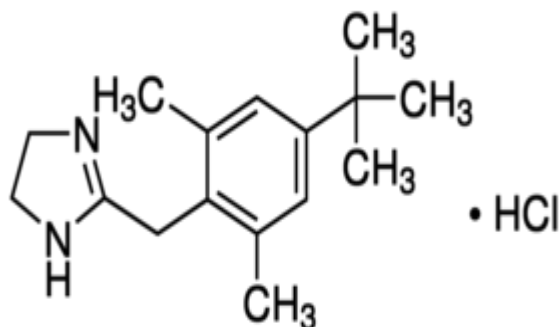


Figure 1: Chemical Structure of Xylometazoline Hydrochloride

Xylometazoline is used topically to relieve nasal congestion and it is fast-acting and highly effective in reducing nasal congestion. Xylometazoline belongs to the imidazoline group that works by targeting adrenergic receptors, which leads to the constriction of blood vessels, thus resuming the flow of nasal air, which leads to a decongestant effect (2,3), This drug is used for the purpose of treating otitis media (5,4), therefore this drug has a high clinical importance, prompting researchers to innovate and develop new methods for its determination; We note by reviewing the literature that there are a large number of methods concerned with quantitatively analyzing this drug in its pure and

pharmaceutical form, as xylometazoline was determined using high-performance liquid chromatography (6-10), using gas chromatography (11), HPTLC (12), as well as Optical spectroscopy (13,14), some electrical methods (15) were used to the analysis of xylometazoline.

The study aims to take advantage of the second derivative of the spectrum in the quantitative determination of xylometazoline in some pharmaceutical forms with high accuracy with a short time.

Practical part

Devices

Shimadzu-1650- UV-Vis, double beam.

Sensitive balance, Germany-Sartorius.

hp ProBook computer

The absorption spectra of the drug were recorded within the wavelength 190-380nm by medium speed scanning and using a 1 cm quartz cell.

solutions

Standard solution

Prepare 1000 µg/ml Take 0.1gm of xylometazoline (of Indian origin) in a 100 ml volumetric vial using water as a solvent and complete the volume up to the mark

Pharmaceutical preparation

A solution of the pharmaceutical preparation was prepared at a concentration of 100 µg/ml in a 10 ml volumetric flask using water as a solvent by dilute. The pharmaceutical preparations used are: decozal/Drops 1mg Amman Pharmaceutical Industries Jordan.

2. The Method of Work

Different amounts (1-800 µg) of the standard drug solution xylometazoline hydrochloride were

transferred into a series of 10 ml volumetric flask and the volume was supplemented with distilled water to the mark. After recording the absorption spectra of the drug against the mock solution, the required derivatization process was performed to obtain the second derivative (5-50 µg.ml⁻¹).

3. Results and Discussion

Absorption spectra

Figure 2 shows the recorded absorption spectrum of the drug with a concentration of (5-50 µg.ml⁻¹) for a range of wavelength 190-380 nm, through the spectrum we notice the appearance of a clear peak at the wavelength of 280 nm.

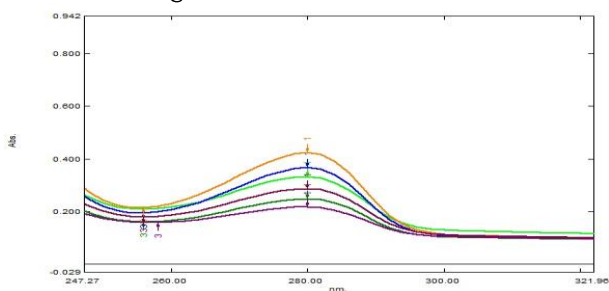


Figure 2: Absorption spectrum of xylometazoline at concentration (5-50 µg/ml).

The second derivative method

The absorption spectrum derivation technique is one of the useful techniques for finding the concentrations of the substances to be estimated individually or in their presence with other substances (mixtures), so that the absorption spectra are highly overlapping (16), the second derivative was applied and through the results it was found that the method can be applied successfully.

In order to complete the work, different measurements were used on the spectra of the second derivative recorded, such as measuring the height of the top and the area under the beam for

the quantitative estimation of the drug in its pure form and in some of its pharmaceutical forms under study. To prepare the second derivative, a spectrum of solutions of different concentrations (5-50 µg/ml) of the drug xylometazoline was used. The results of the measurements made based on the spectra derivative showed that when changing the concentration of xylometazoline is directly proportional to the value of the peak height at the wavelength (220) nm and the value of the area under the beam for the wavelength (214-224 nm). Therefore, the spectra of the second derivative of xylometazoline hydrochloride were recorded, Figure 3 shows the spectrum of the second derivative for different series of concentrations.

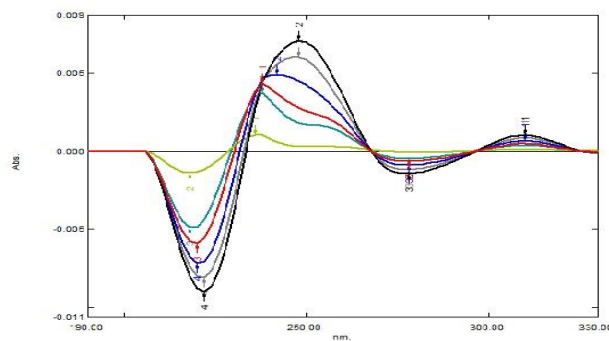


Figure 3: Spectrum of a second derivative of xylometazoline at different concentrations.

Calculations and calibration curves

Through the analytical characteristics and most of the statistical data of the proposed methods, a linear range of the graphs of the calibration curves was obtained between (5-50 µg/ml), the values of the estimating factor ranged between (0.9936 and 0.9974) with a detection limit (3.757-4.471) for the measurement areas used from height Peak (220 nm) and area under the beam (214-224 nm), Table (1) shows the equation of the straight line as well as the slope and estimation factor for the indicated regions.

Table 1: Results of xylometazoline analysis by the second derivative

Compound	Order of derivative	Mode of calculation	Concentration range	λ (nm)	Regression equation	R ²	LOD
Xylometazoline HCl	Second	Peak to baseline	5-50 µg/ml	220	y = -0.0001x - 0.0026	0.9974	3.757
		Peak area		214-224	y = -0.0002x - 0.0031	0.9936	4.471

Accuracy and compatibility

In order to find the accuracy and compatibility of the proposed method, two concentrations were chosen, located at the beginning and end of the calibration

curve (20 and 40 µg/ml). The results showed that the method was compatible and accurate, as it was found that the value of RSD (0.83-4.4%) and the value of Rec (98.75-105%) for the drug Under study, table (2).

Table 2: Accuracy and compatibility of the method

Compound	Order of derivative	Mode of calculation	Drug Conc. µg/ml		Rec%	RSD%
			Taken	Found		
Xylometazoline HCl	Second	Peak to baseline of 220nm	20	20	100	4.35
			40	42	105	4.40
		Peak area of 214-224 nm	20	20	100	2.14
			40	39.5	98.75	0.83

method application

The second derivative spectrometry technique for selected regions (peak height and area under the beam) was used to directly determine the

xylometazoline without the need for pre-separation, as the method was successful. Table 3 shows the results of the analysis of several pharmaceutical forms containing the drug under study by the proposed method.

Table 3: Results of the analysis of several pharmaceutical forms containing Xylometazoline.

Pharmaceutical	Order of derivative	Mode of calculation	Drug Conc. µg/ml		Rec%
			Taken	Found	
decozal/ Drops 1mg Amman Pharmaceutical Industries Jordan	Second	Peak to baseline of 220nm	5	5	100
		Peak area of 214-224nm	5	5	100

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