Simultaneous Derivative Spectrophotometric Determination of Terbutaline Sulphate and Guaiphenesin

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A derivative spectrophotometric method has been developed for the analysis of terbutaline sulphate (TS) and guaiphenesin (GP) in combination by standard addition procedure. Distilled water was used as a solvent. A simple, sensitive and accurate second derivative spectrophotometric method using zero crossing with standard addition of TS is reported in presense of GP.

TERBUTALINE sulphate, a synthetic sympathomimetic amine and a β agonist is used as an effective bronchodilator[1]. Guaiphenesin (GP) is used to reduce viscosity of tenacious sputum and acts as an expectorant[2]. The combination of TS and GP is available in market as tablet formulation containing 2.5 mg and 100 mg respectively. TS is official in IP and determined by colorimetry at 550 nm in tablets[3]. GP is official in IP and is determined by spectrophotometry[4]. USP describes spectrophotometry for bulk drug and formulations (Tablets, capsules and syrup) are determined by HPLC[5,6]. The alternative methods for determination of TS as bulk drug and formulations are HPLC[7], colorimetry[8] and spectrophotometry[9]. The other quantitative methods used for GP as bulk and formulations are GLC[10], spectrophotometry[11], liquid chromatography[12] and HPLC[13].

TS and GP show absorbance in the same spectral range and thereby can not be analysed by direct spectrophotometric method simultaneously without prior separation. The present communication reports a simple, economic, accurate and sensitive method for simultaneous estimation of both drugs in formulations using zero crossing techniques in second order spectral mode.

A Shimazdu 160 A Spectrophotometer (resolution 2 nm) was used for all spectral measurements of TS and HP. Double distilled water was used as solvent throughout experimentation. The stock solution of TS and GP were prepared weighing 10 mg each drug and dissolving in distilled water in 100 ml volumetric flasks separately. From the stock solution of TS (10 µg/ml) and GP (10 µg/ml) were prepared and scanned over wavelength range 350 nm to 200 nm. TS and GP showed maximum absortion at 276.6 nm and 273 nm respectively (Fig 1). Each solution was scanned over recording spectrophotometer and was derivatised from first to fourth derivative order using key entry 1 to 9. After scanning the resolved spectra, second derivative spectra with key entry 5 ($\Delta\lambda$ 17.5 nm) was selected for the simultaneous determination. The zero crossing of TS and GP were at 286.8 nm and 282.8 nm respectively in second order. Therefore 282.8 nm (zero crossing wavelength of GP) as taken as λ_1 and 286.8 nm (zero crossing wavelength of TS) was selected as λ_2 for analysis of GP. Various dilution of TS (0-30 µg/ml) and GP (0-30 µg/ml) were prepared and measured at the selected zero crossing wavelengths respectively for TS and GP. A linear relationship was observed between concentrations and measured absorbances.

For preparation of calibration curves, series of dilutions of concentration 5, 10, 15, 25 and 30 µg/ml of TS and GP from stock solution were prepared and scanned over the range 350 nm - 200 nm and derivatised to second order with predetermined conditions. The absorbances at 282.8 nm and 286.8 nm were recorded to construct calibration curve for TS and GP respectively. Statistical parametrs such as correlation between slope, intercept and coefficient of correlation were also evaluated. To validate the proposed method of simultaneous determination of both drugs, physical admixture containing 10 µg/ml of each drug were assayed by proposed method (Table 1).

Table 1 : Results of TS and GP and Commercial Tablet Formulation

Analyte	Authentic Sample of TS & GP			Commercial samples of TS & GP			
	Percent Found	Standard Error	Standard Deviation	Analyte	Percent	Standard Error	Standard Deviation
TS	101.23	0.7526	1.303	A	99.55*	0.4717	0.942
				B	100.13*	0.4653	0.931
GP	99.36	0.393	0.681	A	100.06*	0.5648	0.4786
				B	99.77*	1.129	0.957

* Average of four estimations
A = Tablet sample
B = Tablet recovery

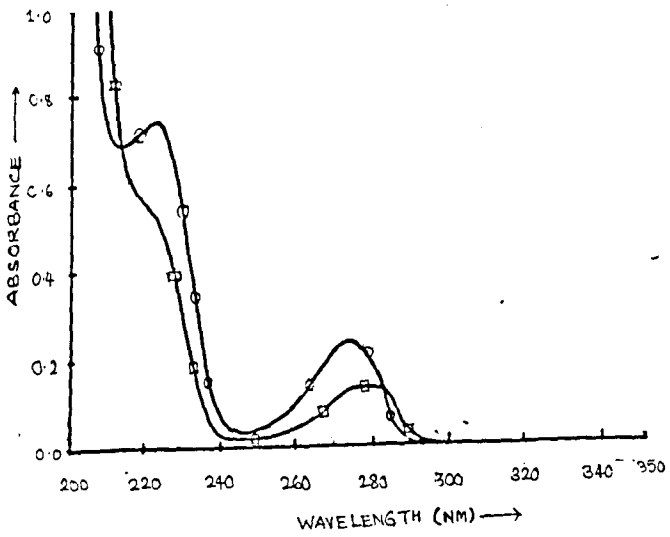

Fig.1 : Simple overlain spectra of Terbutaline Sulphate and Guaiphenesin

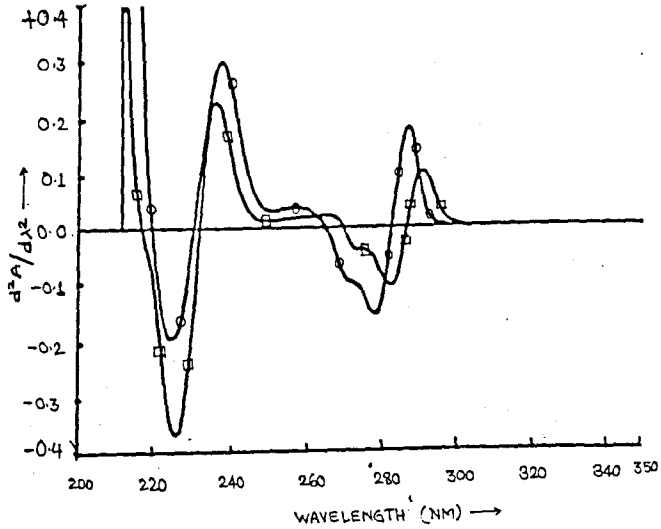

Fig. 2: Second order derivative (N=5) overlain spectra of Terbutaline Sulphate and Guiaphenesin

The commercial formulation as tablet available in composition of TS (2.5 mg) and GP (100 mg) was subjected to analysis by proposed method using the predetermined conditions and concentrations. Twenty tablets were powdered and weight equivalent to composition of tablet was taken in 100 ml volumetric flask, extracted with distilled water and finally filtered and washed the residue with a 10 ml portion of distilled water. The volume of collected extract. and washings were mixed and finally the volume was made up to 100 ml. One ml of this solution was taken in 100 ml volumetric flask and 10 ml of standard TS solution (10 µg/ml) was added. Finally the volume was made upto 100 ml with distilled water. A sample was subjected to spectrophotometric analysis as per the conditions mentioned in earlier experimentation and absorbances were recored (Table 1).

The recovery studies were performed for TS and GP by addition of fixed quantity of the standard solution of TS and GP to preanalysed sample of commercial tablets (Table 1). The regression parameters(slope and intercept) and coefficient of correlation for linearity test for TS are

0.005189,-0.000466, 0.9998 and for GP 0.008443, 0.004333 and 1.0091 respectively.

The statistical validation of the proposed method was carried out by regression parameters and coefficient of correlation for pure-drug, commercial sample and recovery (Table 1). These results conform that the proposed method is simple, economic and accurate for simultaneous determination of TS and GP in combined dosage forms.

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*** Key entry is rate of change dA/dλ at a fixed wavelength interval.**