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Simultaneous Spectrophotometric Estimation of Albendazole and Ivermectin in Pharmaceutical Formulation.

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Research Article

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ABSTRACT

The study aim to develop simple, sensitive, rapid, accurate and precise spectrophotometric method for estimation on albendazole and ivermectin in tablet dosage forms. Pure drug sample of albendazole and ivermectin were dissolved in a mixture of methanol and 1 N HCl (70:30). Two wavelengths selected for formation and solving the simultaneous equations were 248.8 nm for albendazole and 314.4 nm for ivermectin. Absorptivity coefficients for albendazole at 248.8 and 314.4 nm were 63.22 $cm^{-1}g^{-1}L$ and 30.31 $cm^{-1}g^{-1}L$ respectively, while the respective values for ivermectin were 41.59 $cm^{-1}g^{-1}L$ and 23.19 $cm^{-1}g^{-1}L$. The recovery studies were found close to 100 % that indicates accuracy and precision of proposed method. The statistical analysis was carried out and results of which were found satisfactory. Standard deviation values were found low that indicated reproducibility of proposed method. Based on results the developed method could be used for routine estimation of albendazole and ivermectin from combined dosage formulations.

INTRODUCTION

Albendazole (ALB) is chemically methyl 5-propylthio-1H- benzimidazol-2-yl-carbamate [1]. The drug blocks glucose uptake in both larval and adult parasites, which leads to decreased formation of ATP and subsequent immobilization of the parasites. Ivermectin (IVM) is chemically 5-O-dimethyl-22, 2, 23- dihydroavermectin [2]. Ivermectin intensifies GABA–mediated, neurotransmission in nematodes and causes immobilization of parasites. Literature survey reveals that analytical methods including HPLC [3,4,5,6,7], HPLC with fluorescence detenction[8,9,10], LC-MS[11,12,13], capillary electrophoresis[14], spectrophotometric [15], titrimetric and flow injection analysis[16] for estimation of albendazole alone or simultaneously with its major metabolites have been reported. Analytical methods including liquid chromatography[17,18,19,20], capillaryelectrophoresis, immunoaffinity column cleanup procedure[21], liquid chromatography combined with positive electro spray ionization tandem mass spectrometry (LC/ESI-MS/MS) and biosensor immunoassay based on surface plasmon resonance[22] have been reported for the estimation of ivermectin alone or simultaneously with its metabolites in biological fluids/formulations. However, no spectrophotometric method has yet been reported for the simultaneous estimation of albendazole and ivermectin in tablet dosage form. The present work describes spectrophotometric method for the simultaneous estimation of albendazole and ivermectin in tablets.

MATERIALS AND METHODS

Instruments

A Shimadzu UV-1700, UV/Visible spectrophotometer with spectral band width of 1nm, wavelength accuracy of ± 0.3 nm and 1 cm matched quartz cells was used for analytical method development. The spectral data were processed by Shimadzu software kit Ver. 3.7 (P/N 206-60570-04).

Reagents

All reagents were of analytical reagent grade, Stock solutions of 100 mcg of ABZ and 100 mcg of IVM were prepared of each drug by dissolving 10 mg and diluted to 100 ml in methanol:1 N HCl (70:30). Other ranges

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of concentrations were prepared by appropriate dilution using the same solvent. Ranges of concentration were prepared by appropriate dilution using the respective solvent.

METHOD

Pure drug sample of albendazole and ivermectin were dissolved in a mixture of methanol and 1 N HCl (70:30), so as to give five dilutions of standard in concentration range of 5-40 µg/ml for both the drugs. All the solutions were scanned in the wavelength range of 248.8 nm and 314.4 nm. Figure 1 represents the overlain spectra of albendazole and ivermectin. Two wavelengths selected for formation and solving the simultaneous equations were 248.8 nm for albendazole and 314.4 nm for ivermectin. Linearity was observed in concentration range of 5-40 µg/ml for both the drugs. Absorptivity coefficients for albendazole at 248.8 and 314.4 nm were 63.22 $cm^{-1}g^{-1}L$ and 30.31 $cm^{-1}g^{-1}L$ respectively, while the respective values for ivermectin were 41.59 $cm^{-1}g^{-1}L$ and 23.19 $cm^{-1}g^{-1}L$.

$$A_1 = 41.59 \times Cx + 63.22 \times Cy \text{ ---------- (1)}$$
$$A_2 = 23.19 \times Cx + 30.31 \times Cy \text{ ---------- (2)}$$

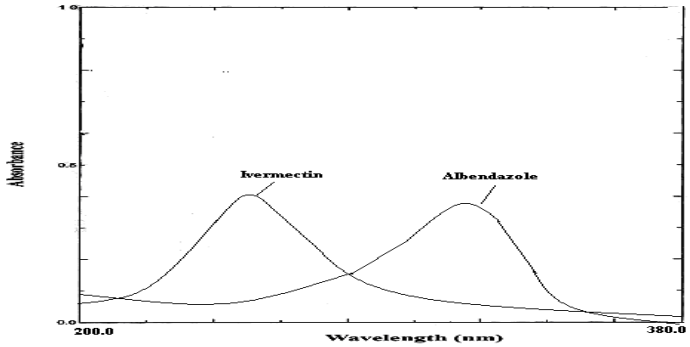

Figure 1: Overlain spectra of ivermectin and albendazole in methanol: 1N HCl (70:30)

Cx and Cy are concentrations of ivermectin (IVM) and albendazole (ALB) in g/l in the sample solution. A_1 and A_2 are the absorbances of the mixture at 248.8 and 314.4 nm respectively. The validity of above framed equations were checked by preparing five mixed standards using pure samples of two drugs, results of which are reported in table 1.

Procedure for analysis of tablet formulation

Twenty tablets [ivermectin (IVM) - 6 mg and albendazole (ALB) – 400 mg] were weighed accurately and average weight per tablet was determined. The tablet was finely powdered and powder equivalent to 150 mg of albendazole (ALB) was weighed to this 8.75 mg of ivermectin (IVM) was added and extracted with 50 ml of methanol: 1N HCl (70:30), sonicated for 10 min. The resultant was filtered through Whatman filter paper no. 41 into100 ml volumetric flask. The filter paper was washed several times with methanol: 1N HCl (70:30). The washings were added to the filtrate and final volume was made up to the mark with the same. Filtrate (0.1 ml) of the sample solution was diluted to 10 ml with methanol: 1N HCl (70:30). The absorbance of this final dilution was measured at 248.8 nm and 314.4 nm. Finally, the concentration of two drugs in sample was calculated. From the final concentration calculated, the amount of the drug added by standard addition method was deducted to find the actual concentration of the tablet, results of which are reported in table 2.

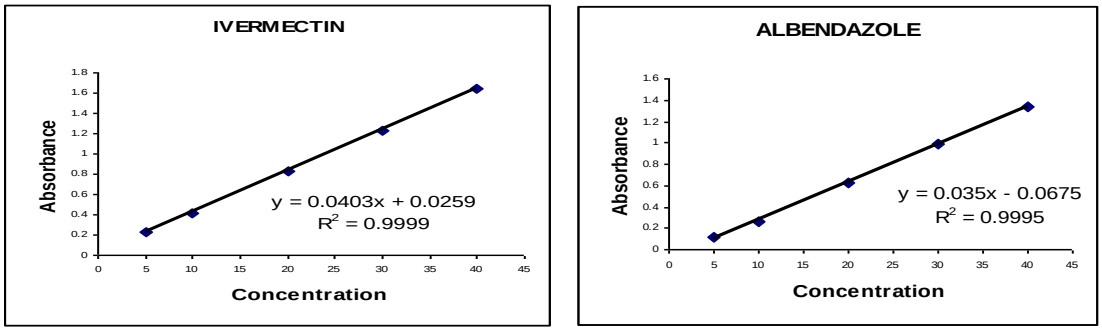

Figure 2: Calibration curve of ivermectin and albendazole.

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Recovery studies

Recovery studies were carried out for both the formulations by addition of known amount of standard drug solution to pre-analyzed tablet sample solution (having standard addition of albendazole) at two different concentration levels. The resulting solutions were analyzed by proposed method. The results of recovery studies were found to be satisfactory and are results are reported in table 3.

RESULT AND DISCUSSION

The developed method involves formation and solving of simultaneous equations. The method is simple and requires only accurately determined absorptivity values of two drugs at two selected wavelengths. Framed equations are validated using laboratory prepared mixed standards of two drugs which give satisfactory results. Percentage label claim of two drugs from two brands of tablet were found to be in the range of 99.51 % to 99.83 % for both ivermectin (IVM) and albendazole (ALB) and respective values of standard deviation were in the range of 0.411 – 0.574 for ivermectin (IVM) and 0.301 -0.318 for albendazole (ALB). For this work UV/Visible double beam spectrophotometer (model 1700) with 1 cm matched quartz cell was used. The method requires methanol:1 N HCl (70:30) in addition to pure drug sample and instrument. The procedure of analysis for tablet formulation was repeated five times with two different formulations and results are reported in table 2.

Table No. 1: Result of validation studies of simultaneous equation method using mixed standards.

S.No.	Concentration		Absorbance		% Concentration	
	IVM	ALB	248.8 nm	314.4 nm	IVM	ALB
1	10	20	1.6744	0.8352	99.80	99.60
2	12.5	17.5	1.6214	0.8178	99.68	99.71
3	15	15	1.5652	0.7989	99.60	99.53
4	17.5	12.5	1.5145	0.7828	99.77	99.76
5	20	10	1.4564	0.7630	99.70	99.20

Table No. 2: Results of analysis of commercial formulations

Brand Name	Label Claim (mg/tablet.)		% Label Claim Estimated		Standard Deviation		Coefficient of Variance	
	IVM	ALB	IVM	ALB	IVM	ALB	IVM	ALB
Bandy Plus	6	400	99.66	99.77	0.411	0.301	0.0041	0.0031
ABZ-Plus	6	400	99.51	99.83	0.574	0.318	0.0057	0.0032

* Each value is an average of five determinations

Table No. 3: Results of recovery studies

Brand Name	Label Claim (mg/tablet.)		Amt. Added to Final Dilution (µg/ml)		Amt. Recovered (µg/ml)		% Recovery	
	IVM	ALB	IVM	ALB	IVM	ALB	IVM	ALB
Bandy Plus	6	400	2.5	2.5	2.47	2.49	98.80	99.60
			5.0	5.0	5.01	4.96	100.20	99.20
			7.5	7.5	7.44	7.46	99.20	99.46
ABZ-Plus	6	400	2.5	2.5	2.48	7.45	99.20	99.33
			5.0	5.0	4.95	5.03	99.00	100.6
			7.5	7.5	7.46	7.52	99.46	100.2

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