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Simultaneous Spectrophotometric Determination of Dipyrone and Caffeine in Pharmaceutical Formulations.

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A simple and rapid spectrophotometric method has been developed for simultaneous determination of dipyrone and caffeine without prior seperation.

DIPYRONE in combination with caffeine is used as an analgesic antipyretic drug.Dipyrone or caffeine in binary combination withother analgesics has been determined by titrimentry[1-3] and spectrometry[4-9]. Inthis study, the absorbance ratiotechnique was applied to determination of dipyrone-caffeine mixtures.

In this method, it is necessary to choose the two wavelengths to be used in the analysis. There are wavelength at which one of the two substances exhibits maximum absorption and the isoabsorptive point. At the isoabsorptive point, dipyrone and caffeine have the same asbsorbancy index values. In this study, there are two isoabsorptive wavelengths (235.1 and 255.2 nm in 0.1 N HCl). Caffeineexhibits maximum absorption at271.4 nm in 0.1 N HCl **(Fig1)**.

At the choosen wavelengths,standart solutions of dipyrone and caffeine obey Beer's Law in the concentration range of 2-24 μg. ml^1 and 1-18 μg.ml^1 respectively.

Table 1: Results obtained with tablets[a]

	Using Qo : 271.4 : 235.1 Found		Using Qo : 271.4 : 255.2 Found	
	CAF	DIP	CAF	DIP
	49.92	466.5	50.74	466.6
	49.55	464.1	50.51	463.7
	49.87	466.1	50.21	467.5
	50.24	462.3	50.64	463.6
	49.81	465.8	50.87	465.3
	49.72	465.3	50.55	465.4
Mean :	49.85	465.0	50.59	465.3
SD :	0.231	1.568	0.226	1.548
RSD (%) :	0.463	0.337	0.447	0.333
REC (%) :	99.7	103.3	101.2	103.4

a. Veraljinr tablets are produced by the Radyum Drug Company, Izmir, Turkey and each tablet contains dipyrone 450 mg and caffeine 50 mg.

The concetrations of dipyrone andcaffeinewerecalculated using the following equaltions.

For caffeine $C_c = \dfrac{Q_o-n}{m} \cdot \dfrac{A_i}{a_i}$ . . . . (1)

For dipyrone $C_D = \dfrac{A_i}{a_i} - C_c$ . . . . (2)

Where c_c and c_D are the concentrations in g.1^{-1} of caffeine and dipyrone in the mixture;A, is the the absorbance values of the mixture at the isoabsorptive point; a, is the absorbancy index value at the isoabsorptive point (21.6 at 235.1 mn and 26.7n at 255.2 mn); n and m are theintercept and the slope values of the Q curve; Q_o is the absorbance ratio values of the mixture. A plot of Q_o (271.4:235.1) and Q_o (271.4 : 255.2) versus the fraction of caffeine

(F_c) in the mixture result in a straight line which is known as the Q curve. The Q curve for this mixture is constructed from the data accumulated on mixtures containing known amounts of dipyrone and caffeine. Using the method of least sqares, the Q_o values corresponding to the fraction of caffeine in the mixture give two equations.For 235.1 and 255.2 nm, respectively.

$Q_o = 1.4751.F_c + 0.7902$ (r=0.9999) and

$Q_o = 1.2043.F_c + 0.6349$ (r=0.9999)

The concentration of caffeine is calculated by substituting intercept and slope values of Q curves in the equation (1). The concentration of dipyrone is calculated from the equation (2).

A Shimadzu model 2100-S UV-Visible spectrophotometer equipped with a recorder was used for all UV measurements.
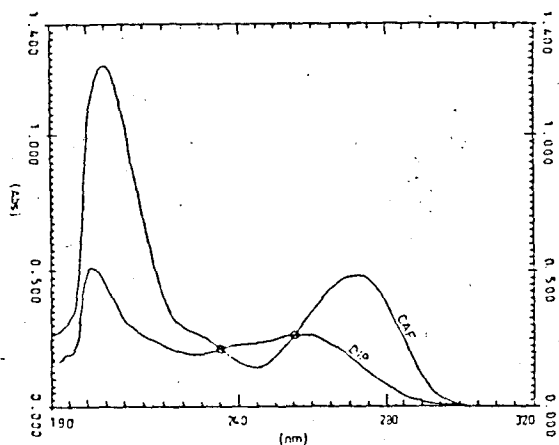
Fig. 1: UV Spectra of dipyrone and caffeine in 0.1 N HCl (c=10 μg. ml⁻¹)

Reference standard sample of dipyrone was obtained from the Hoechst Company and caffeine was obtained from the Ibrahim Ethem Company in Turkey.

Twenty tablets were weighed and powdered. An accurately weighed amount o powdered tablets was placed in a 100-ml calibrated flask. A 60-ml volume of 0.1 N HCl was added to dissolve the medicament and the solution was diluted to 100 ml with the same solvent. The resulting suspension was filtered and 10 ml of filtrate were diluted to 100 ml with 0.1 N HCl. Six samples containing 6-11 ml of this solution were diluted to 50 ml with 0.1 N HCl. The absorbance of these solutions were measured in a 1-cm quartz cell at 235.1, 255.2 and 271.4 nm using 0.1N HCl as a blank.

The analytical data are satisfactory for different ratios of dipyrone and caffeine. Good recoveries are

obtained from the studies which measure absorbance at isoabsorptive points. From this point of view, there is no difference between using two wavelengths. The results indicate that the content of each component in the dosage form can be reliably determined by using the proposed method (table-1).

The proposed method can be easly applied for mixtures containing 10-96% dipyrone and 4-90% caffeine. This method involves no solvent-solvent extraction, is rapid and the manipulative techniques are simple. The analysis is carried out without prior seperation of the components of the mixtures and is applicable to commercial preparations.

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