

## PARASETAMOL VE MEFENOKSALON'UN ÜÇÜNCÜ TÜREV UV SPEKTROFOMETRİSİ İLE YANYANA MİKTAR TAYİNİ

### SIMULTANEOUS DETERMINATION OF PARACETAMOL AND MEPHENOXALONE BY THIRD-DERIVATIVE UV SPECTROPHOTOMETRY

Münevver AÇIKKOL\*

#### SUMMARY

In this paper, the simultaneous determination of paracetamol and mephenoxalone in admixture was realised by third-derivative UV spectrophotometry using a "zero-crossing" technique of measurement at 239.4 nm and 249.8 nm for paracetamol and mephenoxalone, respectively. Linear correlations over the concentration ranges of 5-20  $\mu\text{g.mL}^{-1}$  for paracetamol ( $r = 0.9999$ ) and 5-13  $\mu\text{g.mL}^{-1}$  for mephenoxalone ( $r = 0.9994$ ) were obtained. The proposed method was applied to a commercially available tablet. The relative standard deviations obtained are 0.33 % and 1.17 % and, the average percentage recoveries are 99.96 % and 99.46 % for paracetamol and mephenoxalone, respectively.

#### ÖZET

Bu çalışmada, üçüncü türev spektrofotometrisi ile, parasetamol için 239.4 nm de, mefenoksalon için 249.8 nm de "zero-crossing" ölçüm tekniğinden yararlanılarak iki madde birarada iken miktar tayinleri gerçekleştirildi. Parasetamol için 5-20  $\mu\text{g.mL}^{-1}$  ( $r = 0.9999$ ) ve mefenoksalon için 5-13  $\mu\text{g.mL}^{-1}$  ( $r = 0.9994$ ) konsantrasyon aralığında, doğrusal ölçü grafikleri elde edildi. Yöntem, ilaç piyasasındaki bir tablete uygulandı. Sırası ile parasetamol ve mefenoksalon için standart sapma değerleri 0.33 % ve 1.17 %, ortalama geri kazanma değerleri ise 99.96 % ve 99.46 % dır.

#### INTRODUCTION

Paracetamol is an analgesic and antipyretic drug widely used alone or in combinations with several other drugs for a number of years. The combination of paracetamol with mephenoxalone is a muscle relaxant and used for the aches of skeleton muscles and spasms caused by

\* Adli Tıp Kurumu Başkanlığı, Kimyasal Tahliller İhtisas Dairesi,  
Cerrahpaşa/İSTANBUL.

anxiety. Several techniques, including titrimetric (1), UV-spectrophotometric (2, 3), derivative UV-spectrophotometric (4-8), colorimetric (9), fluorimetric (10, 11), TLC-densitometric (12), GC (13-15), HPLC(16, 17), GC-MS (18),  $TD_x$  (19) methods have been published for the determination of paracetamol in both biological fluids and pharmaceutical preparations. Fluorimetric (20), radiometric (20), HPLC (21), calorimetric and potentiometric (22) methods have been reported for the determination of mephenoxalone. No method has been published for the simultaneous determination of paracetamol and mephenoxalone. For this purpose, this paper describes a method based on third-derivative UV-spectrophotometry.

## EXPERIMENTAL PART

**Apparatus :** A Shimadzu UV-160 double-beam UV-visible spectrophotometer with 1 cm quartz cells was used.

**Chemicals :** Mephenoxalone and paracetamol were kindly supplied by İlsan İlaç Hammaddeleri ve Sanayii LTD, İstanbul, Turkey. Ethanol was obtained from E.Merck, Dramstadt, FRG.

**Stock solutions of paracetamol and mephenoxalone :**  $1 \text{ mg.mL}^{-1}$  each in ethanol were freshly prepared.

**Standard solutions :** Suitable aliquots of the paracetamol stock solution (0.5 – 2.5 mL) were transferred into 100 mL calibrated flasks and 0.6 mL of mephenoxalone stock solution was added to each flask and diluted to volume with ethanol. Suitable aliquots of the mephenoxalone stock solution (0.5-2 mL) were transferred into 100 ml calibrated flasks, 2 mL of paracetamol stock solution was added to each flask and diluted to volume with ethanol.

**Procedure :** The third-derivative spectra of the standard solutions against ethanol were recorded at a slit width of 3 nm, a scanning speed of 40 nm/sec., a  $\Delta\lambda$  of 6.3 nm. The absolute values of the derivative were measured at 239.4 nm and 249.8 nm for the determination of paracetamol and mephenoxalone, respectively. The calibration graphs were prepared by plotting the derivative absorbances of standard solutions against their concentrations ( $\mu\text{g.mL}^{-1}$ ).

**Assay procedure for tablets :** Twenty tablets were weighed and powdered. An accurately weighed amount of the powder, equivalent to

about 150 mg of paracetamol (it includes about 66.6 mg mephenoxalone) was transferred into a 100 mL calibrated flask. 60 mL of ethanol was added and the mixture was shaken mechanically for an hour. The volume was adjusted to 100 mL with ethanol and filtered through a Whatman No. 42 filter paper. The first 20 mL portion of the filtrate was discarded and 1 mL of the filtrate was diluted to 100 mL with ethanol in a calibrated flask. The absolute values of the third-derivative spectrum of this solution were measured at 239.4 nm and 249.8 nm. The amounts of paracetamol at mephenoxalone in tablets were calculated from the regression equations of the calibration graphs.

## RESULTS AND DISCUSSION

The zero-order absorption spectra of paracetamol and mephenoxalone in ethanol were given in Figure-1. Figure-2 shows the zero-order spectrum of the mixture of paracetamol and mephenoxalone.

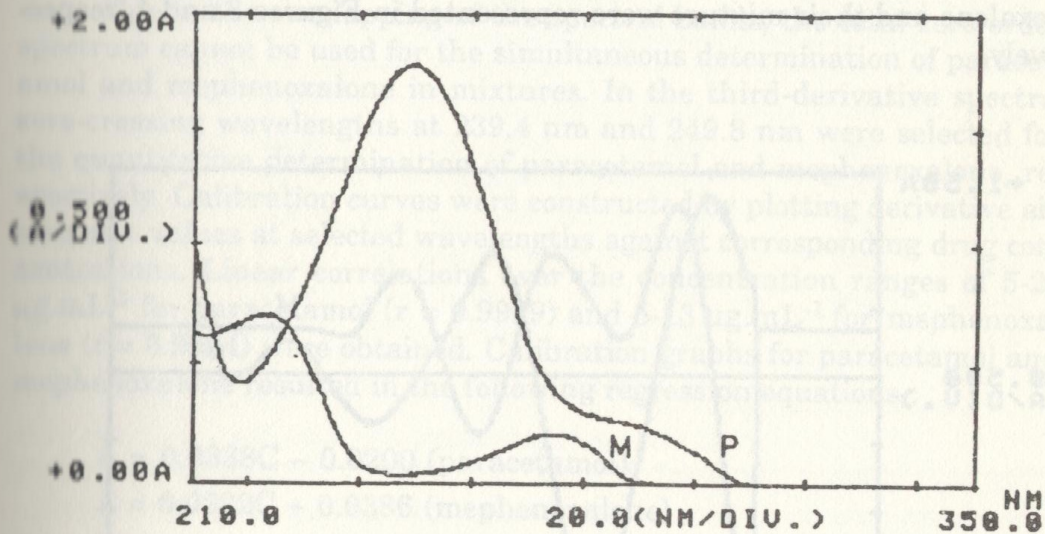


Figure - 1: The zero-order absorption spectra of paracetamol (P) ( $20 \mu\text{g. mL}^{-1}$ ) and mephenoxalone (M) ( $20 \mu\text{g. mL}^{-1}$ ) in ethanol.

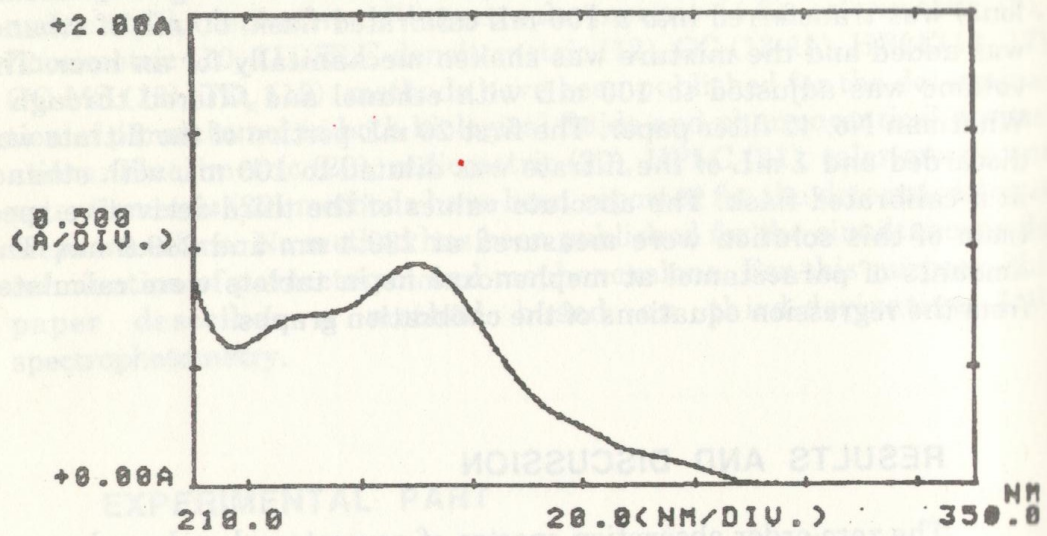


Figure - 2: The zero-order spectrum of the mixture of paracetamol ( $10 \mu\text{g. mL}^{-1}$ ) and mephenoxalone ( $10 \mu\text{g. mL}^{-1}$ ) in ethanol.

The corresponding third-derivative spectra of paracetamol and mephenoxalone and their mixture were represented in Figures 3 and 4, respectively.

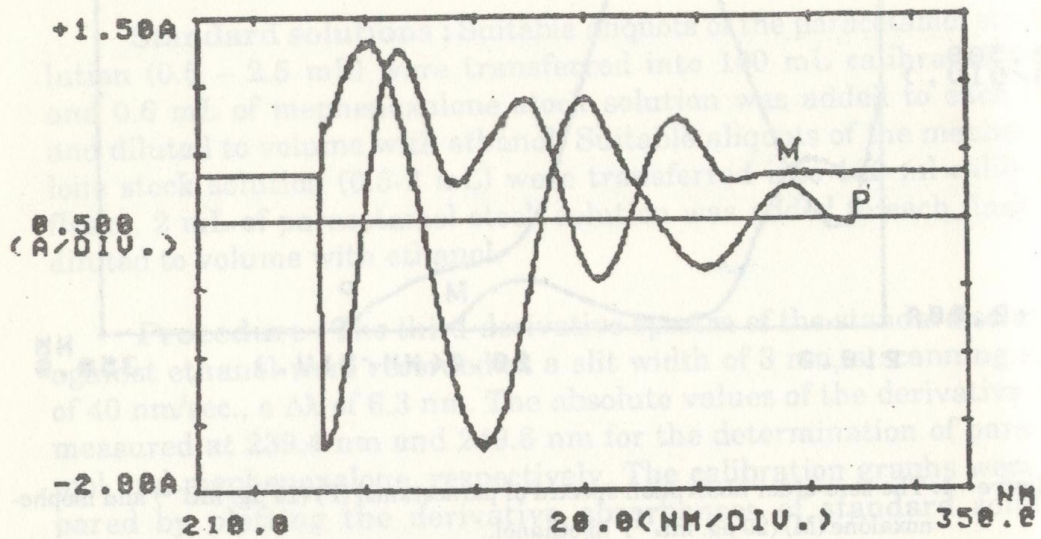


Figure - 3: The third-derivative spectra of paracetamol (P) ( $20 \mu\text{g. mL}^{-1}$ ) and mephenoxalone (M) ( $20 \mu\text{g. mL}^{-1}$ ) in ethanol.

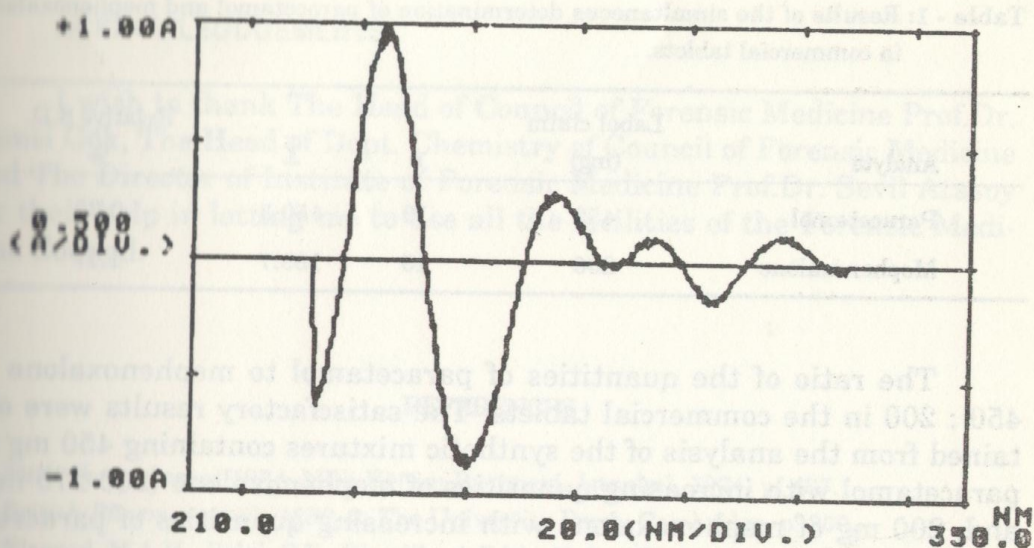


Figure - 4: The third-derivative spectrum of the mixture of paracetamol ( $10 \mu\text{g. mL}^{-1}$ ) and mephenoxalone ( $10 \mu\text{g. mL}^{-1}$ ) in ethanol.

Due to the overlapping of the spectral bands, the total zero-order spectrum cannot be used for the simultaneous determination of paracetamol and mephenoxalone in mixtures. In the third-derivative spectra, zero-crossing wavelengths at 239.4 nm and 249.8 nm were selected for the quantitative determination of paracetamol and mephenoxalone, respectively. Calibration curves were constructed by plotting derivative absorbance values at selected wavelengths against corresponding drug concentrations. Linear correlations over the concentration ranges of  $5\text{-}20 \mu\text{g. mL}^{-1}$  for paracetamol ( $r = 0.9999$ ) and  $5\text{-}13 \mu\text{g. mL}^{-1}$  for mephenoxalone ( $r = 0.9994$ ) were obtained. Calibration graphs for paracetamol and mephenoxalone resulted in the following regression equations :

$$A = 0.0338C - 0.0200 \text{ (paracetamol)}$$

$$A = 0.0222C + 0.0386 \text{ (mephenoxalone)}$$

The time dependence of the signals was studied and no change was observed after 24 hours.

The proposed method was applied to the commercial tablets including paracetamol and mephenoxalone. The assay results were given in table 1. Relative standard deviation of the method was 0.33 % ( $n = 10$ ) and 1.17 % ( $n = 10$ ) for paracetamol and mephenoxalone, respectively.

**Table - 1:** Results of the simultaneous determination of paracetamol and mephenoxalone in commercial tablets.

Analyte	Label claim (mg)	n	$\bar{X}$	Relative S.D. %
Paracetamol	450	10	450.3	0.33
Mephenoxalone	200	10	199.7	1.17

The ratio of the quantities of paracetamol to mephenoxalone is 450 : 200 in the commercial tablets. The satisfactory results were obtained from the analysis of the synthetic mixtures containing 450 mg of paracetamol with increasing quantities of mephenoxalone (200-275 mg) and, 200 mg of mephenoxalone with increasing quantities of paracetamol (450-675 mg) (Table-2).

**Table - 2:** The results of the analysis of the synthetic mixtures.

Amount added (mg)		Found (mg)		Recovery %	
Paracetamol	Mephenoxalone	Paracetamol	Mephenoxalone	Paracetamol	Mephenoxalone
450	275	455.6	274.4	101.2	99.7
450	250	450.8	249.2	100.1	99.6
450*	200*	449.6	200.6	99.9	100.3
500	200	493.2	198.8	98.6	99.4
550	200	551.2	202.4	100.2	101.2
600	200	600	195.2	100.0	97.6
675	200	673.2	196.8	99.7	98.4
Average				99.96	99.46
Average deviation				± 0.76	± 1.19

\* The amount of the drugs in the commercial tablets.

The proposed method is simple, rapid, sensitive and reproducible. Therefore it can easily be applied to the simultaneous determination of paracetamol and mephenoxalone in tablets for routine analysis.

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