

Determination of Sertraline by Ion-Pair Extraction with Methylorange

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Abstract

In this paper, a rapid and sensitive spectrophotometric method has been developed for the assay of sertraline in tablets. The method is based on the ion pair complex forming between sertraline and methylorange and measuring the absorption maximum at 423 nm. A linear calibration graph was obtained for the sertraline concentration range between 1 and 11 $\mu\text{g}\cdot\text{ml}^{-1}$ with a correlation coefficient of 0.9999. The method was applied to commercially available tablets and the results obtained were compared statistically with those of UV-spectrophotometric method.

Key words: Spectrophotometry; Sertraline; Methylorange; Ion-pair extraction

Introduction

Sertraline, (1S-cis)-4-(3,4-dichlorophenyl)-1,2,3,4-tetrahydro-N-methyl-1-naphthalenamine, is a potent and selective inhibitor of neuronal serotonin uptake (Koe *et al.*, 1983) and is currently under development for the treatment of depression and obesity (Heym *et al.*, 1988).

Although a number of analytical methods such as HPLC (Koves, 1995, Patel *et al.*, 1996, Wiener *et al.*, 1990), GC (Tremaine *et al.*, 1989, Logan *et al.*, 1994), GC-MS (Fouda *et al.*, 1987, Eap *et al.*, 1998) and CE (Buzinkaiova *et al.*, 2000) were used to determine sertraline and its metabolite in biological fluids, only one spectrophotometric method based on charge transfer complex formation (Bebawy *et al.*, 1999) has been reported in pharmaceutical dosage forms.

This report presents a simple, rapid and sensitive spectrophotometric method for the determination of sertraline in tablets. The method involves the formation of an ion-pair complex between the drug and methylorange (MO) and after extraction with chloroform, measuring its absorbance.

Materials and Method

Apparatus and chemicals: A Shimadzu UV-160 A UV-visible spectrophotometer with 1 cm matched quartz cells and a WTW pH 526 pH meter with combined glass electrode were used.

Sertraline HCl and its tablets were kindly supplied from Pfizer Inc., Istanbul, Turkey. The other chemicals and solvents used were of analytical reagent grade. The water was deionized and bidistilled.

Standard solutions: Accurately weighed sertraline HCl equivalent to 15 mg sertraline base was dissolved in 15 ml of ethanol and diluted to 50 ml with water. Standard solutions were prepared from these solutions by appropriate dilutions with water.

Sample solution: Tablet powder, equivalent to about 15 mg sertraline was accurately weighed and transferred into a 50 ml volumetric flask, 15 ml of ethanol and 15 ml of water were added

and shaken mechanically for 20 minutes and then diluted to volume with water, mixed and filtered.

Reagent solution: 2.45×10^{-3} M solution of MO in water was prepared daily. For the determination of the reagent amount 4.9×10^{-4} M MO solution was used.

Buffer solution: It was prepared by mixing 20 ml of M sodium acetate with 20 ml of M hydrochloric acid, and the pH was adjusted to 2.5 by adding M HCl or M sodium acetate solution and diluted with water to 100 ml.

Aliquots of 0.1-1.1 ml of standard and sample solutions were transferred into dry test tubes fitted with plastic stoppers. 1 ml of buffer, 1 ml of MO solution and 3 ml of CHCl_3 were added and mixed for 30 seconds on a vortex mixer and centrifuged. 1 ml of this organic phase was pipetted into a 10 ml calibrated flask and diluted to volume with CHCl_3 . After filtration through anhydrous Na_2SO_4 the absorbance value was measured by a spectrophotometer at 423 nm against the blank solution prepared similarly.

Results and Discussion

The optimum conditions for ion-pair formation with respect to the pH of aqueous phase, extraction solvent and amount of the reagent were investigated. The pH was changed from 2 to 7 and the absorbances were measured at maximum wavelengths after extraction of the ion-pair complex with different solvents. The maximum absorbance was obtained with chloroform at 423 nm using phosphate buffer at pH 2.5 (Fig. 1).

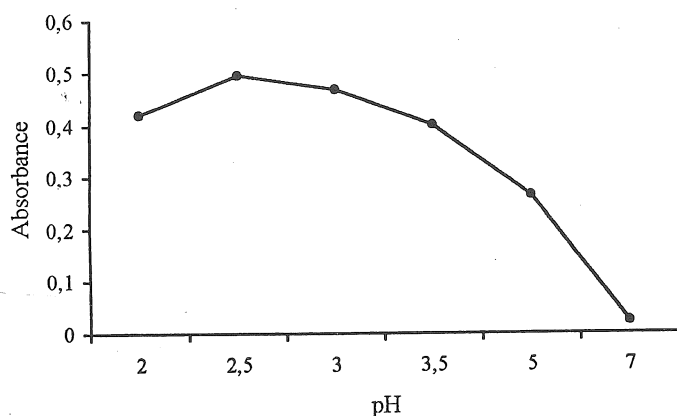


Fig. 1. Effect of pH on the ion-pair extraction with methylorange

The stoichiometric balance of the reaction was established by Job's continuous variation method. The results showed that 1:1 complex was formed between sertraline and dye. This was also confirmed by the molar ratios method where the optimum molar ratio of the reagent to sertraline was found as 2.5 (Fig. 2). The ion-pair complex was stable in chloroform at least for 7 h at room temperature.

Under the optimum conditions described above, a linear correlation was obtained between 1-11 $\mu\text{g} \cdot \text{ml}^{-1}$ concentration ranges of sertraline. The regression equation was $A = 0.00895 C - 0.0233$ ($r = 0.9999$).

The proposed method was applied to commercially available tablets. The results were statistically compared with those of the UV-spectrophotometric method, which was based on measuring the absorbances of sertraline at 273 nm (Johnson *et al.*, 1991).

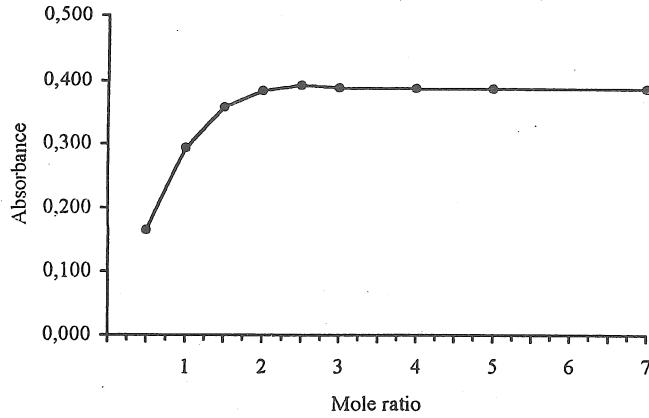


Fig. 2. Effect of reagent concentration on the reaction of sertraline with methylorange.

When the t- and F- tests at 95% confidence level were applied, there was no significant difference between the mean values and the precisions of the two methods (Table).

Table 1. Determination of sertraline in tablets (50 mg sertraline/ tablet)

Statistical values	Proposed method	UV-spectrophotometric method
Mean [mg]	50.22	49.63
Recovery [%]	100.44	99.26
SD	0.52	0.47
RSD	1.03	0.94
n	6	6
Confidence limit	49.75- 50.69	49.21- 50.05
t-test of significance*	t= 2.07	(p= 0.05, T= 2.23)
F-test of significance*	F= 1.24	(p= 0.05, F= 5.05)

There was no interference due to most of the common ingredients as magnesium trisilicate, dimethylpolysiloxane, magnesium stearate, lactose, starch and carboxymethylcellulose.

In conclusion, the proposed method was more sensitive than that reported by Bebawy *et al.* Additionally, the procedure is more simple, rapid and inexpensive. The time required for a single determination is 5 minutes and the method can be applied for quality control testing and drug stability monitoring confidently.

Özet

Bu çalışmada, sertralinin tabletlerindeki miktar tayini için hassas ve hızlı bir spektrofotometrik yöntem geliştirilmiştir. Bu metod sertralinin metiloranj ile oluşturduğu iyon çifti kompleksinin 423 nm de gösterdiği maksimum absorpsiyonun ölçülmesi esasına dayanmaktadır. Yapılan ölçmelerde, kalibrasyon eğrisinin 1-11 $\mu\text{g.ml}^{-1}$ konsantrasyon aralığında ($r=0.9999$) doğrusal olduğu saptanmıştır. Geliştirilen yöntem sertraline içeren tabletlerde miktar tayinine uygulanmış ve bulunan sonuçlar UV-spektrofotometrik yöntemle elde edilen sonuçlarla istatistiksel olarak kıyaslanmıştır.

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