RESEARCH PAPER

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Extraction Spectrophotometric Determination of Tamoxifen Citrate using Naphthalene Blue 12BR or Alizarine Red-S

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Simple, rapid and sensitive spectrophotometric methods have been described for the determination of Tamoxifen Citrate, based on the formation of chloroformsoluble ion-association complex between Tamoxifen and the dye (naphthalene Blue 12BR or Alizarin Red-S) in acidic medium. The coloured species exhibit maximum absorbance at 620 and 440 nm respectively.

TAMOXIFEN citrate is extensively used as an anticancer agent and is official in B.P.[1] and U.S.P.[2]. The reported methods for the determination of the drug are GC[3], TLC,[4] HPLC,[5-7] Polarography[8] and a few spectrophotimetric methods.[9] The extractive spectrophotometric technique provide a sensitive method for the determination of this drug in µg/ml level.[10] An aci-dye complex method using Naphthalene Blue 12BR (NB-12BR, azo dye) or Alizarin Red-S (AR-S, anthraquinone dye) for the estimation of Tamoxifen in pahrmaceutical formulations is reported for the first time in the present communication.

EXPERIMENTAL

A Systronics model 106 digital spectrophotometer with 1 cm matched quartz cells and Elico LI-120 digital pH meter were used. All chemicals used were of analytical reagent grade.

Reagent solutions:

Aqueous solutions (0.2% w/v) of NB-12BR (BDH, C.I. No. 20500) and AR-S (Chroma, C.I. No. 58005) were prepared and treated with chloroform to remove chloroform soluble impurities prior to use. HCl (0.1M) Glycine-HCl buffer of pH 1.5 were prepared in distilled water.[11]

Standard and sample solutions

Accurately weighed amount of Tamoxifen citrate (bulk sample or tablet powder) equivalent to 100 mg of Tamoxifen was treated with 10.0 ml of 1.0M aqueous NaOH solution and the released free Tamoxifen was extracted with 4x15 ml Chloroform successively. The combined extract was made upto 100 ml with chloroform. 10.0 ml of this solution was further diluted to 100 ml with chloroform to give a working standard solution containing 100 µg/ml of Tamoxifen.

Procedure with NB-12BR (Method A) or AR-S (Method B)

Aliquots of the standard drug solution (50-175 ug, for method A or 50-600 ug, for method B) were placed in a series of 125 ml separating funnels. Exactly 5.0 ml of pH 1.5 buffer solution and 1.0 ml of NB-12BR or 2.0 ml of 0.1 M HCl and 4.0 ml of AR-S were added and the total volume of the aqueous phase was adjusted to 15.0 ml or 10.0 ml with distilled water for methods A and B respectively. Requisite volume of chlorofrom was added to each funnel to make the organic layer 10.0 ml and the contents were shaken for 2 min. The two phases were allowed to separate and the absorbance of the organic layer was mea-

Table 1: Assay and Recovery of Tamoxifen in Pharmaceutical Preparations

Tablets	Labelled amount (mg)	Amount found* (mg) by proposed methods		B.P. method[1]	Recovery**,%
		A	B		
T_1	10	9.89	9.97	9.93	99.1
T_2	20	19.93	19.89	19.89	99.6

* : Average of six determinations

** : After adding 10 mg each value is an average of three determinations.

sured during the stability period (1-20 min. or 1 min. - 3 hrs.) at 620 or 440 nm for methods A and B respectively. The amount of the drug was computed from its calibration curve.

RESULTS AND DISCUSSION

The optical characteristics such as Beer's law limits (ug/ml), Molar extinction coefficients (1. $mole^{-1}$) and Sandell's sensitivities (ug/cm^2/0.001 absorbance unit) were found to be 5.0 - 17.5, 8.32×10^3, 0.044 and 5.0 - 60.0, 5.9×10^{3d} 0.062 for methods A and B respectively. The slopes, intercepts and correlation coefficients obtained by linear least squares treatment of the results were found to be 2.218×10^{-2}, 6.09×10^{-4}, 0.9999 and 1.58×10^{-2}, $- 5.25 \times 10^{-4}$, 0.9999 for methods A and B respectively. The precision and accuracy were ascertained by analysis of six replicate samples containing 120 ug (for method A) and 400 ug (for method B) of the drug and the percent relative standard deviation and percent range of error (95% confidence limit) have been found to be 0.78, 0.82 and 0.67, 0.69 for methods A and B respectively.

Commercial tablets were successfully analyzed by the proposed methods. The values obtained by the proposed and reference methods for pharmaceutical preparations are listed in **Table 1**. Recovery experiments were performed by standard addition method. Commonly used excipients did not interfere. The stoichiometric ratio of the drug-dye complex was studied by the slope ratio method[12] and was found to be 2:1 and 1:1 for methods A and B respectively.

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