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Spectrophotometric Determination of Trifluoperazine Hydrochloride Using Peak Area

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Abstract:
The determination of triflouperazine hydrochloride in pure and dose forms has been developed using a simple spectrophotometric approach. Triflouperazine HCl interacted with sulfanilic acid through oxidative coupling. The area under the peak between the two wavelengths of 482-601 was measured and the estimate range was 0.5-100 µg/mL with a coefficient of 99.97 and RSD=1.9498. The method was applied to estimate Triflouperazine HCl in tablets with satisfactory results.

Keywords: Trifluoperazine hydrochloride, Spectrophotometry, Peak area

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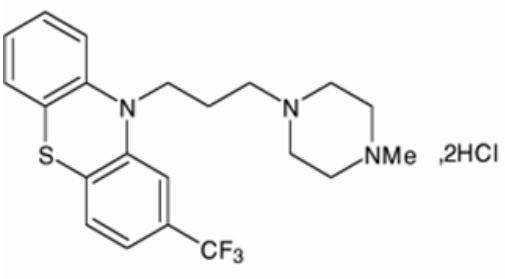
▪ Introduction

Trifluoperazine hydrochloride is a white-colored powder that is odorless and highly dissolved in water and alcohol, partially dissolved in diethyl ether, and is kept isolated from the light in dark containers [1]. The scientific name of trifluoperazine hydrochloride is 10-[3-(4-methyl-1-piperazinyl) propyl] trifluoperazine hydrochloride-2-trifluoro-methyl phenothiazine di-hydrochloride), it has the following chemical structure as shown Figure1.



. **Figure 1:** Chemical structure of Trifluoperazine- HCl

It has been known to induce QT prolongation and ventricular tachycardia, which can lead to by sudden death [2], and is therefore used in the treatment of various mental diseases like schizophrenia. The drug is used in the treatment of depressive diseases [3]. It was estimated via various methods including electrochemical using electrodes made of carbon. [4], various spectrophotometric methods used these methods including oxidative coupling reaction [5, 6, 7, 8, 9, 10]. Ultraviolet Spectrophotometric [11]. In addition, other types of techniques

have been used: the indirect atomic absorption method [12]. Voltammetric method [13] (. Potentiometric sensors [14]. Electrochemical Sensing [15]. Flow injection analysis [16, 17], RP-HPLC [18, 19], HPLC [20] and derivative spectrophotometric, HPLC and thin layer chromatographic, [21].

- ***EXPERIMENTAL WORK***

Apparatus

All Spectral measurements and absorption readings were carried out using a JASCO-360 spectrophotometer. Cells of glass and quartz with a light path of 1 cm were used. The pH was measured using a HANNA pH211 pH meter and a BEL-sensitive balance was used to carry out the required weighing operations.

Reagents: The reagents used in this research were of a high degree of purity and the drug in its pure form will be brought from the State Company for Pharmaceutical Industry Samarra - Iraq

- Trifluoperazine hydrochloride (500 µg/ml) Weigh 0.05 grams of the substance and dissolve it in distilled water and complete the volume to the mark of 100 milliliters and keep in an opaque vial. Likewise, the Tablets were prepared in the same way.
- Sulfanilic acid ($2.8x10^{-3}$) M 0.05 g of the substance was taken and dissolved in distilled water and completed to the mark of 100 ml in a volumetric flask.
- This solution N-Bromosuccinimide ($1x10^{-2}$) M0.05 g of the substance was taken and dissolved in distilled water and completed to the mark of 100 ml in a volumetric flask.

Recommended Procedure .

It was added to a 10 ml volumetric vial containing 1 ml of trifluoperazine solution and 1 ml of sulfanilic acid $2.8x10^{-3}$ M and 1.25 of n-bromosuccinimide- (1x10-2) M and supplemented with distilled water to the mark. And taken spectrum absorbance at 537 nm, the absorbance was measured against a reagent blank.

OUTCOME AND DISCUSSION

- **Absorption Spectrum**

Absorption spectrum was taken for the colored product formed from the reaction of 500 µg of trifluorperazine hydrochloride with the sulfanilic acid in the presence of N - Bromosuccinimde. The formation of a colored seat gives the highest absorption at the wavelength of 537 nm**,**

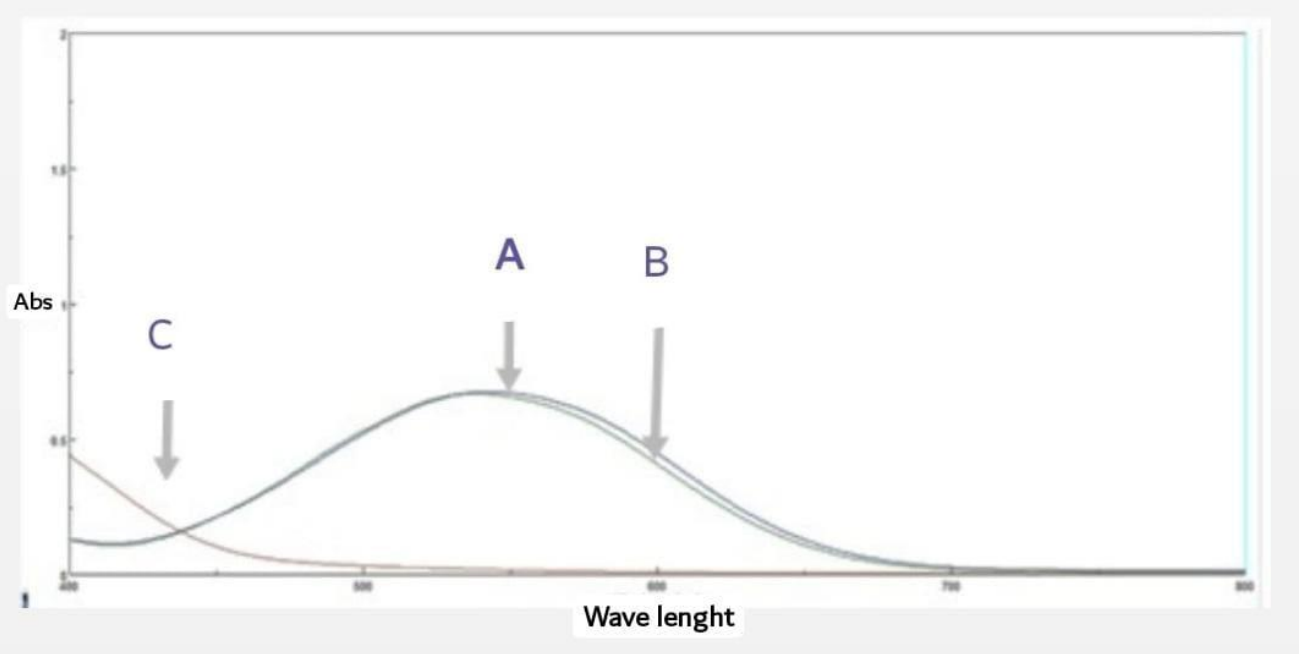


Figure2: Absorption spectra in (a) 50µg trifluoperazine hydrochloride with sulfanilic acid against, distilled water (b) 50 µg trifluoperazine hydrochloride versus detector blank and (c) detector blank versus H_2O.

The optimum conditions were studied in this research that affect absorption

- ***Sour effect***

When adding many acids, there was a decrease in the intensity of adsorption, so it was not recommended to add any type of added acids, such as CH_3COOH H_2SO_4 and HCl, appear in chary (1).

Table1: effected of diffracted acid on absorbance

1Moler Type of A (ml)	with out	HCl	HNO_3	H_2SO_4	CH_3COOH
Absorbance	0.6235	0.6041	0.5894	0.5721	0.3982

- ***Effect of Sulfanilic acid***

To study the optimum volume of the reagent on the absorption of dye, different volumes of 0.5-1.5 were added, and the volume of 1 ml was optimal, taking different concentrations of trifluoperazine hydrochloride. table2.

Table2: effect of amount of sulfanilic acid

SAR **(**ml,2.8×10^{-3}**)**	Absorbance					R^2
	12.5	25	35	50	75	
0.5	0.087	0.1581	0.2205	0.3118	0.4612	0.9908
1	0.1562	0.3127	0.4742	0.6212	0.9373	0.9968
1.5	0.0654	0.1479	0.1992	0.4165	0.6293	0.9808

- ***Effect of Oxidizing agent Concentration***

The generated output was up to the top absorbance when 1.25 ml of N-Bromosuccinimide ($1x10^{-2}$) M, when added a mixture of trifluoperazine hydrochloride, sulfanilic acid, therefore was selected in the procedure since it gives high sensitivity table3**.**

Table3: effect of oxidant concentration on absorbance

NBSamounte ml,1×10^{-2} M	Absorbance / µ trifluoperazine HCl / ml						R^2
	12.5	25	37.5	50	75	100	
0.5	0.1052	0.2041	0.3269	0.3925	0.5921	0.7631	0.9933
1	0.1255	0.2696	0.3652	0.4956	0.6232	0.9844	0.9974
1.25	0.1542	0.3102	0.4321	0.6239	0.9336	1.246	0.9989
1.5	0.1150	0.2465	0.3322	0.3753	0.4153	0.7134	0.9151

- ***Effect of Temperature and Reaction Time***

Following the color development at various temperatures with used to measure the reaction time. At 5-minute intervals, the absorbance was measured versus detector blank treated in the same method. After 10 minutes at room temperature, the production of a colored complex for trifluoperazine Hydrochloride reached its maximum intensity. It stays on for 24 hours.

Table4: Effect of Temperature and Reaction Time on absorbance

Temp (C)	Absorbance / min standing time								
	Immediately	10	20	30	40	50	60	90	120
10	No.R	No.R	No.R	No.R	No.R	No.R	No.R	No.R	No.R
Room temp	0.6055	0.6132	0.6162	0.6187	0.6265	0.6230	0.6280	0.6266	0.6127
45	0.5100	0.5902	0.6108	0.6105	0.6124	0.6110	0.6040	0.5840	0.5243

No .R=No reaction

- ***Effect of Basics***

He studied adding different amounts of bases after completing the addition of the reaction components and before dilution, and the practical results showed that adding the base had a negative effect and therefore it was not recommended to add it.

Table5: effect type of basic on absorbance

(1ml)Type of Base 1M	Absorbance
NaOH	0.4161
KOH	0.4087
Na_2CO_3	0.3987
$NaHCO_3$	0.3142

- **Effect of Order of Addition**

To make sure that an additional sequence was added, different sequences were added, and the best sequence was the one that was studied in the preliminary study. Do it another way a loss in absorbance**.**

After creating the optimal conditions, the area under the peak was found

It shows the absorption spectrum of trifluorperazine hydrochloride according to the method proposed in which gave the highest peak of absorption at 537 nm, and the area under the peak was determined between the two wavelengths 482 and 601 nm.

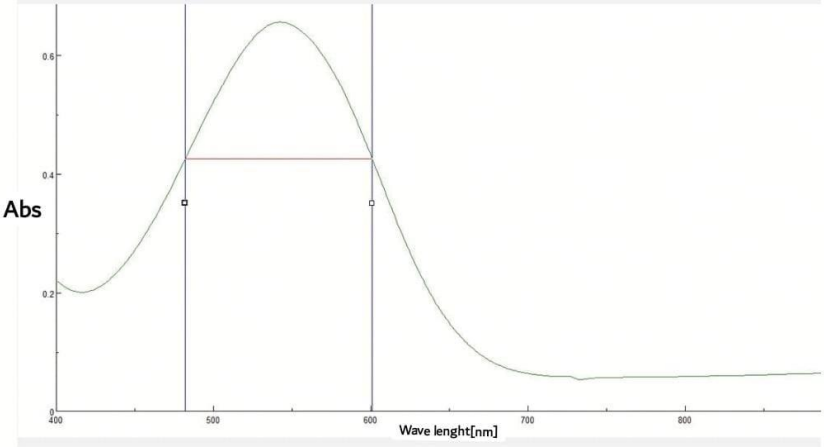


Figure 4: Absorption spectrum of trifluoroperazine hydrochloride treated according to the proposed method with determination of sub-peak area.

- **Standard orientation:**

To a series of 10 mL volumetric vials, 1.25 mL N-bromosuccinamide was added.

And adding increasing volumes of a solution of trifluoroperazine hydrochloride at a concentration of 500 micrograms / ml, from 0.01 to 2 ml, according to the optimal addition in the first chapter, and 1 ml of sulfonic acid, then the absorption was measured after 10 minutes of dilution with distilled water to the mark at the two wavelengths 482 and 601 nm.

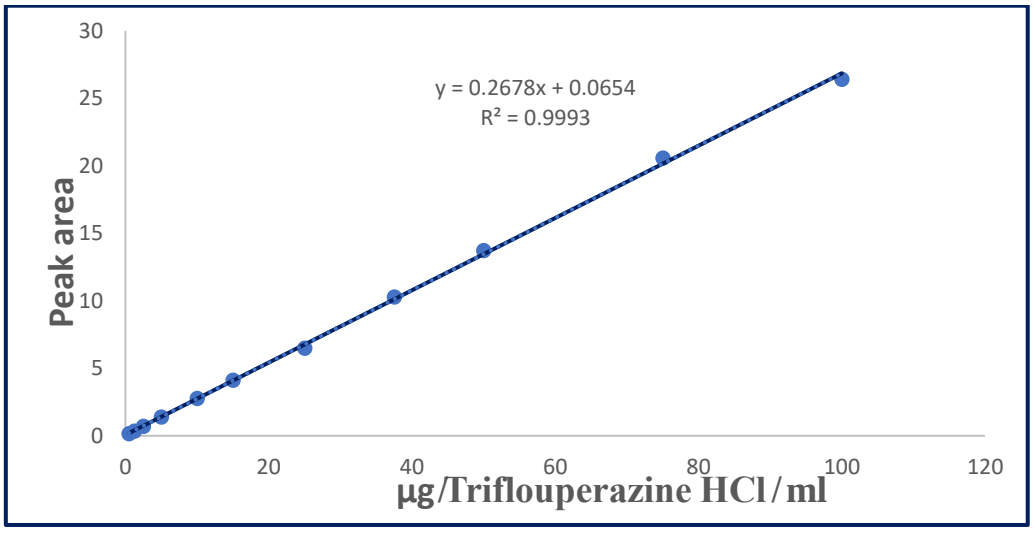


Figure 5.Standard profile of trifluorperazine hydrochloride treated according to the proposed method.

- ***Accuracy and Compatibility:***

After we established the optimal conditions, which we showed in the previously mentioned work method, the accuracy of the method was checked by calculating the recovery ratio and examining the compatibility of the method by calculating the relative standard deviation for two different concentrations of trifluoroperazine hydrochloride (mg1) 15 and 25, and two concentrations 1.25 and 37.5 (mg 5). The obtained results are shown in Table (2-1), which show that the method has good accuracy, and the error rate does not exceed -0.8363, with good agreement (not more than 0.4195) for mg1, and the error rate does not exceed 0.2209, and with good agreement (not more than 1.9498) for mg5.

Table 6: Accuracy and tuning of the suggested method

Pharmaceutical preparation	Certified Value (mg)	Amount present (µg/ml)	% Recovery	Drug content found(mg)	texp
IRALZIN SDI Iraq	1mg	5	98.42	0.996	0.692
		25	99.56	0.995	0.568
IRALZIN SDI Iraq	5mg	10	101.20	5.060	0.4
		25	100.96	5.048	0.212

*Average for five determinations.

The Applied part:

To ensure the application of our proposed method and its validity on the medicinal product, it was applied to the medicinal product, pills, for two concentrations of 1 and 5 mg, Samarra Pharmaceutical Company (Iraq), and by taking two concentrations each of 5 and 25 micrograms for 1mg, and 10 and 25 micrograms for 5mg, and they were treated according to the method that was suggested for standard solutions. The results obtained are in the table.

Table 7: Results of applying the proposed method for the determination of trifluoroperazine hydrochloride

Pharmaceutical preparation	Amount ml)present (µg/	Amount measured	% *Recovery	RSD%	RE%
IRALZIN 1mg SDI Iraq	5	5.12	102.40	0.4195	-0.8363
	25	24.87	99.48	0.0799	-0.1788
IRALZIN 5mg SDI Iraq	1.25	1.24	99.20	1.9498	0.2209
	37.5	37.8	100.80	0.0721	-0.0243

*Average for three determinations.

And that the calculated t-value for concentrations 5 and 25 micrograms is 0.692 and 0.568 of 1 mg, and that the calculated t-value for concentrations 10 and 25 for 5mg is 0.4 and 0.212 less than the tabular value with 2 degrees of freedom and at a confidence level of 95 percent, which indicates the success of our method.

- **CONCLUSIONS**

A spectrophotometric method was developed for the determination of trifluoroperazine hydrochloride. The method was based on measuring the sub-peak area of trifluoroperazine hydrochloride between two wavelengths 482 to 601 nm. The method was applied successfully in the determination of the pharmaceutical preparation (tablets of two different concentrations

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