RESEARCH ARTICLE

Selective Spectrophotometric Determination of 4-amino Antipyrine Antibiotics in Pure Forms and their Pharmaceutical Formulations

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ABSTRACT

Quantitative measurements of 4-amino antipyrine (4AAP) were made, using the Colorimetric oxidative coupling technique and can be assayed via coupling it through reagents N, N-dimethylaniline, in the presence of $NaIO_4$, Utilizing Sodium carbonate (Na_2CO_3) 0.1N as the basic medium, a sufficiently 4-amino antipyrine (4AAP) stable color is obtained. This way is suitable for analyzing 4AAP in common tablet formulations without prior separation gives color stability for over 6 hours. Wholly of the ways are simple, accurate, and precise. The advanced method was helpful in the control spectrophotometric of drug 4AAP in pharmaceutical formulations.

Keywords: Pharmaceuticals, oxidative coupling, 4-Aminoantipyrine, spectrophotometric, Colorimetric.

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INTRODUCTION

To both scientists and the general public, personal care products and pharmaceuticals are of scientific and public interest because they are new ecological impurities.[1] Data of frequent utilize, vast quantities of PPCPs have been removed into aquatic ecological pollution of surface, and water ground needs to be emerged as problem serious in recent years drug developing contaminants must become the main worry because of their little bio-degrade ability, great perseverance, and facile bioaccumulation.[2,3] These complexes contain diverse groups like anti-inflammatory agents, antibiotics, regulators blood-lipid, and hormones steroidal households, Hospitals and factories of a drug are the main drug bases in waste-waters. The incessant removal of these contaminants into the surroundings importantly impact human aquatic and health methods.[4] Therefore, these contaminants utmost be removed from waste-water. 4-Aminoantipyrine ($C_{11}H_{13}N_3O$) shown in Figure 1, is famous as the kind of non-steroid anti-inflammatory drug that is a metabolite of aminopyrine by analgesic and anti-inflammatory possessions.[5,6] It is utilized employing a reagent for bio-chemical reactions producing phenols or peroxides 4-AAP stimulates liver microsome and is too utilized to measure extra - acellular water. The derivatives derived from 4AAP have appeared several activities pharmacological like anti-inflammatory, anti-oxidant, analgesic, antipyretic, anti-fungal possessions, and anti-microbial. Furthermore, in recent reports in the field of anticancer investigation 4AAP exhibited promising ant proliferative against human carcinoma cell lines and as agents cleavage for DNA.[7,8]

EXPERIMENTAL DETAILS

Chemicals and Reagents

Reagents and Chemicals of analytical grade were utilized in the found study. Drug 4-Aminoantipyrine and its normal excipients, including tablets made with pharmaceutical-grade content, were supplied by the SDI, Iraq-Samarra.

REAGENTS AND MATERIALS

4-Aminoantipyrinedrug stock solution (100 mg/L): The stander solution of drug 4-Aminoantipyrine was prepared via dissolving 0.1 g in 100 mL of distilled water. Dilutions Serial by DW were made to cover the range working.

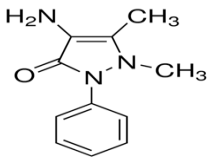

Figure 1: chemical structure of 4-Aminoantipyrine

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Calibration Graph and the Statistical Data

Under the chosen best conditions, a calibration curve was constructed (Figure 2). The graph showed that the color method is obeyed Beer's law in the concentration series of 2 to 20 mg/L of the 4-Aminoantipyrine drug in 10 mL of the final volume. Table 1 shows the statistical result of the calibration curve of spectrophotometric estimation of the 4-Aminoantipyrine drug. The precision and accuracy of the method were tested by determining five replicates of standard drug solutions at three concentration levels. The values of the percentage of relative errors [(Error%) and (RSD%)] for these replicate measurements of the 4-Aminoantipyrine drug were calculated.[9]

LoD = 3 x (1)

LoQ = 10 x (2)

4-Aminoantipyrine Drug (100 mg/L)

They were prepared via dissolving a 0.1 gm of the 4-Aminoantipyrine drug in the quantity of distilled water, utilizing an ultra-sonic device to dissolve the compound and dilute it to the volumetric flask 100 mL. A stock solution was prepared daily and freshly via suitable dilution of the standard solution by DW.

Sodium Carbonate Solution

Sodium hydroxide (0.1g) was prepared in a volumetric flask of 100 mL by completing DW to 100mL.

N, N-dimethylaniline Reagent Solution

Prepare the reagent solution by diluting 0.1g was dissolved 100 mL of DW in a 100 mL volumetric flask.

RESULTS AND DISCUSSION

Influence of Time Stability of the Color Compound

The influence of time on stability and reaction of the dye color was too calculated. Figure 3 appear that the great intensity can be found next 3 minutes from the commencement of the reaction, and the color complex was unchanging for about 6 hours, which gradually decays in 24 hours. Therefore, 3 minutes was chosen as the time before our stidy.[10,11]

Effect of Concentration $NaIO_4$

It was observed the reaction between drug (4AAP) and reagent (N, N dimethylaniline) depends on the oxidation method through $NaIO_4$ in a basic medium. The influence of several concentrations of $NaIO_4$.[5] The obtain of the best data, and lowest value of the blank at the concentration of 0.2 gm /100 mL and was considered as optimum value[9,11] as appear in Figure (4) next 0.2 g/100 mL the absorbance has a not effect or constant.

Influence of Concentration (N, N dimethylaniline)

The effect of several volumes of N, N dimethylaniline was studied. A concentration of 0.1 gm in 100 mL about 2 mL gave the maximum absorbance and was selected for further utilize. The data appear in Figure 5. It was observed that the reaction among 4AAP and (N, N dimethylaniline) depends on the oxidation way by Na_2CO_3 in the basic medium. Thus,

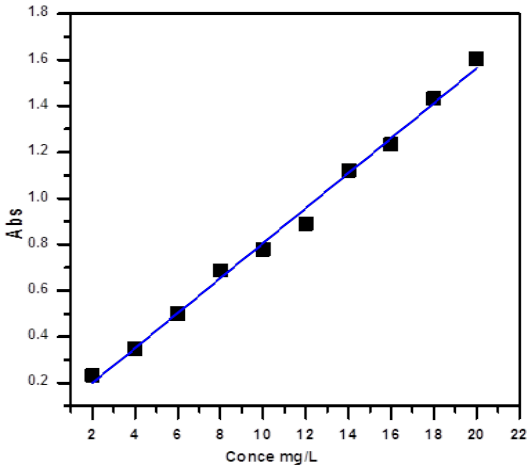

Figure 2: Calibration curve of 4 AAP

Table 1: Statistical of calibration data for different concentrations of 4AAP.

Factors	*Proposed Process*
λ_{max} (nm)	550
law lambert Beer limit (μg.ml^{-1})	2–20
Molar absorptivity (L.mol−1.cm^{-1})	1.54 *10^3
Sandal's sensitivity (μg cm^{-2})	1.319 x 10 $^{-8}$
Regression equation	(Y = m X + C)
Slope (m)	0.07581
Intercept (C)	0.04831
Correlation coefficient (r2)	0.9938
% Relative Standard deviation (RSD%)	0.4166
standard deviation (SD)	0.115
Color	Violet
Limit of Detection LoD (μg.ml^{-1})	4.5903 x 10^{-6}
Limit of Quantitation LoQ (μg.ml^{-1})	1.53 x 10^{-5}

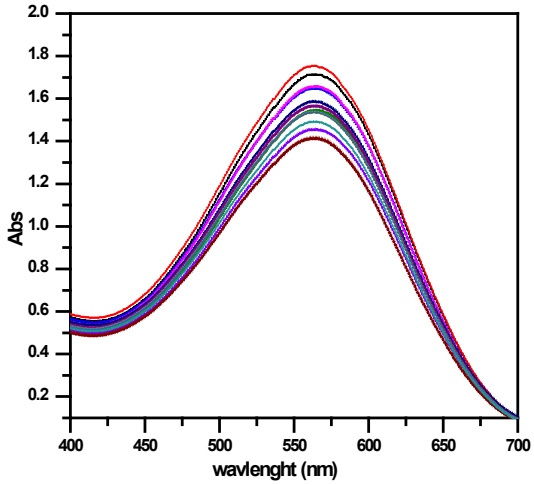

Figure 3: Kinetic Absorption spectra of A (20 ppm) of drug 4AAP treated as described below process drug 6 hours.

the effect of several volumes of N, N-dimethylaniline (0.4, 0.6 0.8,1, 2, 4, and 5 mL) was studied in Figure 5. The data found indicated that the absorbance greater via the rise volume of (N, N-dimethylaniline) up to 2mL gives the maximum absorbance and was selected for further utilize.[12-15]

Effect of Temperature

Considering an optimal temperature is a very significant factor, and it considerably promotes the selectivity of the reaction; thus, it was substantial to be optimized firstly[16,17] via Utilizing a water bath (hot or ice for 10 minutes) to estimate the temperature of 20 to 35°C whose data appears in Figure 6. It shows that 20 °C gave a minimum blank value, better sensitivity and was selected for furthermore utilization in this study.[18.19]

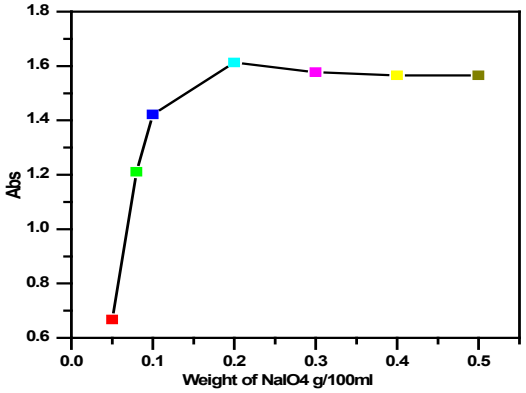

Figure 4: absorptions value of oxidant found in several quantities of $NaIO_4$

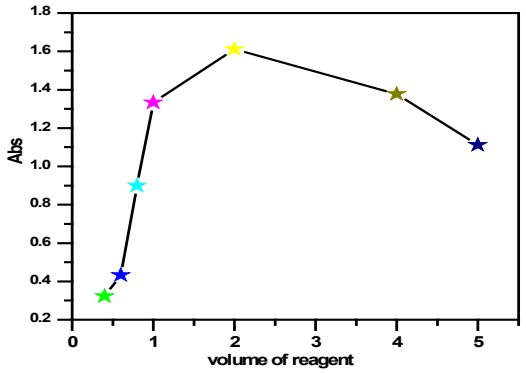

Figure 5: Effect of several volumes of (N, N dimethylaniline) reagent

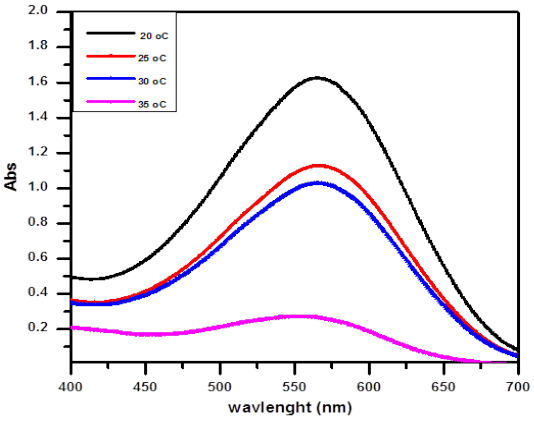

Figure 6: Influence of the solution temperature of 4AAP.

Influence of the Order Adding

The order of adding was studied via prepared solution by several arrangements as appear in Table 2 and Figure 7. The maximum absorbance can be obtained only with the following order of drug (4AAP)-NaIO4–base-N, N-dimethylaniline. Order No. 1 was chosen because it gives the best absorbance and greater sensitivity.[14,17]

Influence of the Nature Base

Determine the utmost good base Figure 8; we utilized wholly of the base NaOH, Na_2CO_3, and $NaHCO_3$ because the formation of the color depends on the base and quantity

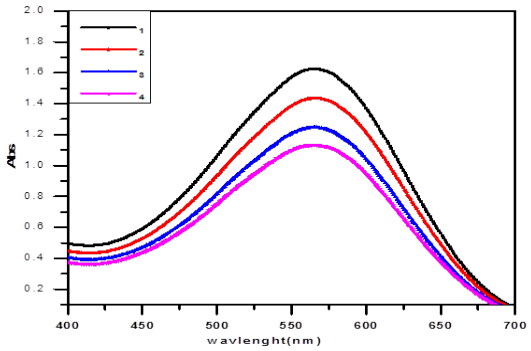

Figure 7: Influence of the order of adding of 4AAP.

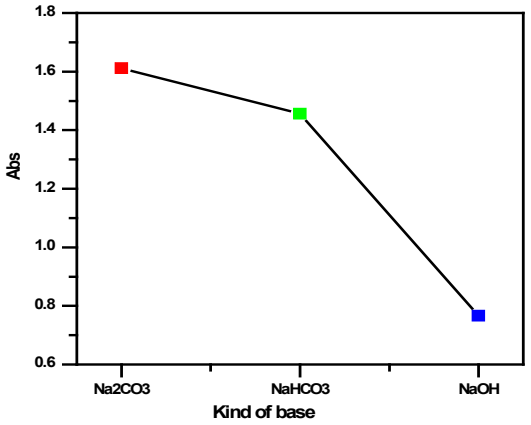

Figure 8: Influence of the kind base adding of 4AAP drug

Table 2: Aspiration order of 4AAP and N, N dimethylaniline:

NO.	*Adding order*	*Abs.*
1	Drug–NaIO4-base-reagent	1.611
2	Drug-base- NaIO4–reagent	1.521
3	NaIO4-drug-base–reagent	1.222
4	NaIO4-base-drug–reagent	1.151

Table 6: Estimation of 4AAP in several formulations utilizing the proposed and official method

Pharmaceutical preparation	*Conc. Of 4AAp (ppm)*			
	Present	*Found*	*E %*	*Rec%*
4-Aminoantipyrine drug tablet 250 mg (DSI), Iraq	10	10. 033	0.323	100.3
	15	15.111	0.734	100.7
	20	20.0833	0.414	100.4
4-Aminoantipyrinedrug tablet 500 mg(DSI), Iraq	10	9.9333	-0.674	99.3
	15	14. 833	-1.125	98.87
	20	20.0166	0.08	100.08
4-Aminoantipyrinedrug tablet 250 mg Iran	10	10.0666	0.66	100.6
	15	14.999	-0.0066	99.99
	20	20.1833	0.908	100.9
4-Aminoantipyrinedrug tablet 250 mg (Indi)	10	9.75	-256	97.43
	15	15.15	0.999	100.9
	20	20.1833	0.908	100.9

of base. Utmost of these, base suffer low absorbance values when utilized in excess, can be arranged in increasing Na_2CO_3 < $NaHCO_3$ < NaOH.[20] The concentration of base Na_2CO_3 was too studied, and it was found that 0.1 N gave obvious stable solution color, sound sensitivity, great intensity, and the maximum absorbance value.[13,19]

Analytical Applications

The proposed process was helpful positively to the analysis of exact formulations of pharmaceuticals having 4AAP. Table 6 indicates that by those found via the official spectrophotometric method utilizing reagent (N, N-dimethylaniline),[5] have good accuracy, and selectivity[4] reveals that there is no vital alteration in accuracy and precision among the proposed ways and the official spectrophotometric techniques. So, a matching process for the analysis of 4AAP is extra positive, which exhibits the best sensitivity and great efficiency.

CONCLUSION

In this study, the proposed way is simple, stable, and highly sensitive. Maximum absorbance reached at 550 nm via utilizing (UV-Vis) spectrophotometer and considering 4-Aminoantipyrine drug has a significant part of the stability and increases the selectivity until reaching equilibrium indeed of solution NaIO4. However, N-dimethylaniline's increased concentration gives the absorbance adverse conduct and finds stability coupling at smallest 6 hours.

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